



Inventory of SME waste streams

on ZKD business area in The Hague

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1. Introduction

This report is part of the Interreg 2 Sea project Upcycle Your Waste (UYW). The objective of UYW is to accelerate the adoption of circular business cases by SMEs that transform waste flows into resources at local level in partner areas. This is to be achieved by developing and introducing knowledge, tools and facilities that enable SMEs and local authorities to make this transition. For this upcycling, solutions for the main waste streams of companies located in the business districts targeted in partner areas are identified, selected and implemented. The partner areas are IJmond, Den Haag, Oostende, Roubaix, Kent and Norwich. The overall result of UYW is an increase of 360 SMEs adopting circular business cases, and 20% of the waste streams being upcycled. Additionally, the project will lead to an improved capacity of local authorities, business district managers and SMEs in other parts of the 2 Seas region to introduce circular business practices, through our capacity building and dissemination and transfer activities.

This report is about the results of the waste scans performed in the business area Zichtenburg, Kerketuinen, Dekkershoek (ZKD) in The Hague in The Netherlands.

The objective of obtaining information on waste streams are described in chapter 2. The characterization of the participating companies on the ZKD business area is presented in chapter 3. In chapter 4 the kind and amounts of waste are described and in chapter 5 the cost or income of residuals and collectors as far as given are mentioned. Chapter 6 goes in to details about the options of separating more waste(d) materials and chapter 7 reveals the interest of the interviewees about the project. The results are analysed in chapter 8 and conclusions and recommendations are given in the final chapter.



2. Objective and approach

2.1. Objective

The objective of the waste scans at companies in the pilot areas in order to realize upcycle solutions is threefold:

1. Determine types, volumes, quality and cost for collection & processing of the current waste streams as accurate and detailed as possible;
2. Determine options for cost reduction of waste;
3. Providing the basics for the developing of collective upcycle business cases;

These objectives are realized by scanning the characteristics of the waste streams of the participating SMEs in the pilot areas.

2.2. Set up of the waste scans

The waste scans were set-up as follows:

1. Development of a common method and choice of parameters for analysis (e.g. waste type, grade of separation, quality, volume, costs, transport)
2. Develop a method for data collection
3. Set up a roll-out plan
 - a. Train the people who will question the SMEs
 - b. Interview the first 10 companies
 - c. Evaluate the questions and approach, make improvements if necessary
 - d. Interview rest of the companies
 - e. Send results to TU Delft
4. Organise visits and interviews companies
5. Sharing information/communication

The interviews started in April 2020 and were finished beginning July 2021. The start of the interviews was right at the beginning of the Corona pandemic. Therefore, the approach of physical meetings had to be altered to interviews by phone. In most cases the interview on the barriers and drivers was combined with the waste scans.

In the corona crisis, companies were very busy coping with the effects of the Corona crisis. Many companies did not have time for an interview due to severe disruptions in their operation. In order to attempt to get as much response as possible the period in which the interviews were conducted was extended with at least 6 months.



2.3. Set up of the interviews

To interview the SMEs a list of questions was developed with the partners. An overview of these questions is given in Appendix A.

The scans started with questions about the characteristics of the companies and the interviewees. The questions are about the type (sector) and size (in FTE) of the company and the function of the interviewee. The purpose of this is to be able to determine if certain sectors are dominantly present and if the answers on waste streams, waste separation etc differ per type or size of the interviewed company. The result is presented in chapter 3.

In the next series of questions are about the different types and amounts of waste stream, preferably separated and collected separately. If possible, the amount of weight per time (e.g. month or week) was asked, or else the amount of used volume of the container was asked as well as the seasonal fluctuations of the amount of waste. The outcome of these questions is presented in chapter 4.

The totalized amounts of waste, per type of waste stream and separately collected waste streams should show the amounts of mixed waste and separately collected materials and products and any variation in that quality. This overview can be used to determine measures to enlarge the quantity and quality of separated waste streams or find waste streams that can be re- or upcycled by the company itself, or between companies on the business area or by external upcyclers. Besides measures that could be taken internally within the SMEs, this information is also to be used for instance for price contests on upcycling, (collective) tendering for upcycling solutions, or resource broker activities to find upcycling solution for individual waste streams

To see if solutions could be economically viable, an overview of the costs of the materials is presented in chapter 5. The cost given could be per time or per unit of weight (e.g. kilogram) and included rent of the container as well as processing the material. In chapter 5 also an overview of collectors is given. This information gives an overview on the different types of materials and parties that collect these waste streams in the business area.

To get information on what the companies see as opportunities to separate more waste for recycling and reuse the companies were asked; what kind of materials or products are already separated and what materials they have in their residual bin that still can be separated and re-/upcycled. For example, the separated paper/cardboard could contain cardboard boxes, which represent additional value because they can be traded as a product instead of a recycle material. The answers are presented in chapter 6.

The scans end with questions on ideas and remarks and if the interviewee would like to be kept informed about the project. The answers are presented in chapter 7.



3. Interviewed companies

The scans with the participating SMEs on business area Zichtenburg, Kerketuinen Dekkershoek (ZKD) started with questions on the characteristics of the company and the interviewee. The outcome on the question of the size of the company is given in (paragraph 3.1). The question about the function or position of the interviewed person gives information what the source of the information is (paragraph 3.2). The size of a company is based on the numbers of fulltime employees, because this data is usually easily available and not considered confidential.

Information about the type of company is provided in section 3.3 and to determine whether certain sectors are dominant and whether the answers differ based on the sector, size and/or function (eg composition of waste stream or barriers) of the interviewee.

3.1. Size company

The total amount of companies that were interviewed was 81, of which 34 are micro companies and 30 are 10+SMEs. Of the 10+SMEs, 25 were small companies (between 10 and 49 FTE) and 5 were medium sized enterprises. There were also 4 large companies (more than 250 FTE) interviewed. 13 companies did not register their size.

Size of company	Number
Micro (1 – 9 FTE)	34
Small (10 – 49 FTE)	25
Medium (50 – 249 FTE)	5
Large (>250 FTE)	4
Unknown	13
Total	81

3.2. Position/function interviewed persons

On the question “What is your position/function?” the answers of the interviewed people are given in the table below. In total 81 companies were interviewed. Of these, 64 companies answered the question about position/function of the interviewee.

In the table below “owner” means the person who owns the company. The CEO is the person that manages the company (director). With “management” we mean the middle layers of the organization, just below the owner or CEO. “Coordinators” are in most cases quality or environmental coordinators within the company.

Type of function	Number 10+ SMEs (10 FTE or larger)	Number micro companies
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Owner	7	23%	16	47%
Management	21	70%	9	26%
Support staff	0	0%	4	12%
Others	2	7%	5	15%
Total	30	100%	34	100%

The function of the interviewed people of micro companies are mainly owners, while that of the 10+SMEs are also a significant part management, which is to be expected in larger organizations.

3.3. Type of company

The interviewees were asked: "What type of business is your company?". The results are given below. Of 1 micro and 4 10+SMEs the business line wasn't provided. The types of companies have been classified in the general terms like production, trade, food (see the table below), except for the garages, which was defined as a specific group (car Branch) due to the relative high amount of garages interviewed at 10+SMEs at ZKD.

Type of company	Amount Micro companies			Number of 10+SMEs		
Production	7	21%	2a	4	15%	2a
Car branch	1	3%	4a	4	15%	2b
Office	11	33%	1	3	12%	3a
Food	1	3%	4b	3	12%	3b
Trade	7	21%	2b	2	8%	4
Distribution and logistics	0	0%		1	4%	5
Miscellaneous	6	18%	3	9	35%	1
Total	33			26		

The interviewed micro companies were predominately offices and in lesser numbers trade or production companies. The interviewed 10+SMEs has a wide variety of types of companies, which are equally divided between production, car Branch, each 15% and Offices and food companies, each 12%.



4. Amounts of materials and products

4.1. Introduction

The scanned companies were asked which and how much residual materials or waste(d) products they have and are being separated and if there is any deviation in amount or volume throughout the year.

Because we expected that companies would only know the size of the waste container and we would not get enough detailed information to determine exact volumes or weights, we instead asked for the frequency of emptying and the filling level of the bins $\frac{1}{4}$, $\frac{1}{2}$ were, $\frac{3}{4}$, or completely full. For solid materials (eg wood or plastic), the quantities given in volume are multiplied by known bulk densities (Appendix B) to present the results in one unit; weight.

If a business area has many similar companies, for example garages and other activities in the automotive sector, the variety of found materials is expected to be small. Never the less companies may have their own unique types of residual materials.

4.2. Amounts of materials and products

The found amounts of materials and waste(d) products were given in different units of weight, volume and number. All found materials and waste(d) products are presented in appendix C either mentioned in weight, volume or pieces per year. Because there are 40 different materials (groups) and multiple products found, a top 10 of these materials has been made and is shown in the table below. To give an impression how common or uncommon a listed material is, also the number of companies who have this material is given.

Material at micro companies	Amount (ton/year)	Percentage	number of companies
Wood type B	3.672	48.92%	2
Residual (mixed waste)	1.686	22.46%	67
Paper/cardboard	1.105	14.72%	41
Appliances (e.g. washing machines, fridges etc.)	240	3.20%	1
Bulk waste	240	3.20%	1
Construction waste	173	2.30%	1
Metal and scrap iron	87	1.16%	7
Textile (clothes)	74	0.99%	1
Swill	40	0.53%	1
Plastics	39	0.51%	9
Others	152	2.02%	50
Total	7.506	100%	

Eleven materials of which only the volume could be given in cubic meter did not represent enough weight to be presented in the top 10. The same applies for three types of products that were only given in pieces per year. 30 other types of materials from 50 companies representing 2.02 % of the total weight are for example organic waste, thinner, frying oil, brake fluid, aluminum, glue/resin mix and spray cans. The list of materials in weight also

contains given waste(d) products, such as pallets and car batteries, are also listed in the table “Products” in appendix C.

The question on deviation was answered by a limited number of companies. An overview of the results is given in the table below. The deviation gives an impression of the fluctuation in percentage of weight of the material throughout the year. This information is relevant with regards to the collection. Plastics is the only material from the top 10 that has a fluctuation of more than 1%. Other waste flows also have a high fluctuation but are not represented in the top 10 waste flows (weight wise).

Seasonal deviation	%
Large volume materials	
Plastics	19%
Paper	0.7%
Residual	0.02%
Smaller volume materials	
Car tires	35%
Beverage glass bottles	20%
Car fuels	7%
Coolant	7%
Car batteries	1%

5. Costs and collectors

5.1. Introduction

To see if an upcycling solution is economically feasible, the current cost of discarding or income by selling residual materials or products was asked. In order to have an overview which company is collecting what types of residual material, the companies were asked to provide information on their waste contractor per waste stream. This overview gives information on the possibilities to cooperate with collectors.

5.2. Cost of collection and processing

In the interviews, 81 companies mentioned a waste stream 324 times in total. A quantity was mentioned in 224 times and in 50 times also the costs were indicated. The latter means that we know the collection and processing costs of 1 in 4.5 waste streams.

The costs found are in most cases combined costs (or income); meaning a combination of costs for renting the container, material collection and processing.

Processing costs can refer to recycling, reuse or incineration. Most of the costs given are based on the volume of the container. The costs given in the table below are given in €/ton or €/m³. The table below gives an overview of the provided costs for residual waste and paper/cardboard for which more than 5 answers were available. The table below shows the lowest and highest costs, the average and the median costs. Because some given prices are extremely high (or low) based on other given costs and known market prices, these costs are seen as outliers. In the table below only highest outliers are present.

Prices given > 5 times	Number of answers given	Median without outliers (€/ton)	Median (€/ton)	Average (without outliers) (€/ton)	Average (€/ton)	Outlier costs (€/ton)	Outlier costs (€/ton)	Lowest cost (€/ton)	Highest cost (without outlier) (€/ton)
Residual waste	15	289	265	455	292	1326	1697	135	481
Paper/cardboard	15	177	169	334	249	1528		52	694

The outliers are costs have great impact on the average of the costs. That is why the average has been calculated with and without outliers. It is assumed that the average without the outliers is a more realistic average. The median is the cost figure separating the higher half from the lower half of the data. If the data contains an even number of outcomes, the median is the average of the two numbers separating the higher half from the lower half of the data.

In the table above we see that there are enormous variations in waste costs. It shows that the highest (without outliers) and lowest costs for residual waste, between 135 and 481 €/ton and paper/cardboard between 52 and 694 €/ton.

Of eleven waste streams and waste(d) products costs less than 5 times costs for waste collection and processing have been given. The table below provides an overview. The figure "0" means that the costs are € 0, so the material is collected for no cost or income.

Prices given < 5 times	Unit	answers given	Cost (in unit)	Cost (in unit)	Cost (in unit)	Cost (in unit)
Coolant	€/m ³	4	0	0	125	321
organic waste	€/ton	4	0	0	0	125
Brake fluid	€/ton	2	0	571		
Scrap iron	€/ton	2	-130	0		
Glass	€/ton	2	130	364		
Blasting grit	€/ton	1	1,667			
Car liquids	€/m ³	1	444			
Plastics	€/ton	1	150			
Plastics mixed	€/ton	1	275			
Swill	€/ton	1	257			
Wood	€/ton	1	537			

The figure for wood seems far above the market price and could be an outlier. In IJmond the median was 64 €/ton and the average price 140 €/ton (without the outliers).

5.3. Collectors

On the question of who collects certain waste (d) materials a total of 233 answers were given, involving 52 different waste companies. Also answers like “charity” or “i bring them away myself” were given. A top 5 of most mentioned waste companies can be given for only three types of materials: paper/cardboard, residual waste and plastics (table below).

Material	Total	Renewi	Suez	GP Groot	Veolia	Van Lier
Paper/cardboard	48	22	6	3	4	1
Plastics	19	8	3	2	2	0
Residual waste	56	29	10	3	3	2

In the top 10 most mentioned waste(d) materials the following answers were given:

- of 3 materials (wood type B, textile (clothes), and swill) no name of a collector was/could be given by the interviewee
- of 3 materials only one name of a collector could be given: construction waste (GP Groot), appliances (Renewi) and bulk waste (Renewi)
- of 2 materials only two names of a collector could be given: scrap iron (Elsinko and Remet) and metals (Boots and Geelhoed)



6. More materials to separate

6.1. Introduction

To find out if companies see opportunities to separate more materials and waste(d) products and if these materials could be collected at a, for the companies, acceptable cost or income, two questions were asked:

1. what materials or products do you have in your residual waste that could be separated?
2. what materials or waste(d) products do you have in the already separated materials that can still be separated? Examples are discarded plastic buckets in the plastic recyclables, or cardboard boxes in the paper and cardboard in the recycling container or sawdust in the wood recycling container.

6.2. Results

On the question what materials or waste(d) products companies have in their residual waste that could be separated, 40 answers were given, besides 10 answers stating "none". The mentioned materials are:

- 10 times plastic was mentioned, being 1 out of 4 answers;
- 3 times paper and wood were mentioned;
- 2 times broken car parts, cans, food waste, office materials, organic waste, pet bottles (plastic) and textile were mentioned;
- mentioned once were cardboard boxes, coffee cups (plastic), coffee ground, cork, cups, glass, hair products (spray's etc.), one-way pallets, paraffin and truck tires.

On the question what materials and waste(d) products do you have in the already separated materials that can still be separated, 23 answers were given. The materials were:

- mentioned twice were boxes, car batteries, car tires, cardboard boxes and pallets;
- mentioned once were coffee grounds, crate wood untreated, paper, confidential paper, plastic packaging, plastic wrap, remains of iron from production, residual waste from the office, rests of cables, shrink wrap, varied metal objects, vegetables & fruit, and wood saw dust.

Based on these outcome a lot of smaller material streams could be separated and recycled.



7. Impression of the interviewees

7.1. Introduction

The interviewees were asked whether:

1. they had questions, comments or additions;
2. they want to be kept informed of the results of the research and the progress of the project;
3. they want to receive the newsletter with information about events, updates, progress etc.

By asking for comments or additions, we can find out whether the entrepreneur is satisfied, is interested in the subject and has his own ideas or thoughts about the project and upcycling, so that we can supplement the project and thus increase support.

With the answers to the question whether the interviewee wants to be kept informed or wants to receive the newsletters, we want to know whether people want to stay involved in the project and start working with the results. Of course, we also try to build and maintain a relationship in this way.

7.2. Results

On the first question almost 25% of the interviewees responded.

Most of these answers were ideas or questions on what could be done more with the waste and some were curious about the results of the project. A few examples:

- Everything is clear. Would like to get rid of the cost of cardboard processing! Do you think the reuse of this is a nice side effect?
- Solutions should not take up more space than the existing containers;
- For small companies with little waste, it is often expensive or inconvenient to conclude contracts for waste separation. It could be an idea for the municipality to place these underground waste containers nearby;
- Wonders to what extent the municipality can do something about this. Is it more about agreements between the municipality & collection service;
- What will be the next stage of the project?
- Would like to be contacted if costs saving is possible.

Of the micro companies 71% and of the 10+SMEs 63% wants to be kept informed about the project. More than half of the companies wants to receive newsletters. For the micro companies this was 18 of the 34 (53%) and 15 out of the 30 (50%) of the interviewed 10+SMEs. The impression is that most of the interviewees are interested in the project and want to be kept informed.

8. Analysis

8.1. Interviewed companies

Chapter 3 provides an overview of the size and type of the 81 scanned companies and the function of the interviewed officers within these companies. Most interviewees of 10+SMEs (93%) had a high management function (owner, management). At micro companies this was a bit less, 73%. The number of micro companies and 10+SMEs were about the same, although of 13 companies the size was not given. Most of the micro companies were offices, production or trade companies. The composition of the 10+SMEs varied more and included more food related companies.

8.3. Materials and products

The top 10 materials found comprise 98 percent by weight. The top 3 materials and waste (products) are wood type B (49%), residual waste (22%) and paper/cardboard (15%). Wood type B is wood with paint, glue, resin etc. and was specifically mentioned by 2 companies. Wood type B can contain products such as one-way pallets. Wood type B is usually brought by plywood factories. The waste stream that is mentioned the most (67 times) and which represents the second stream by weight is residual waste.

The waste flows in the top 10 mostly concern material groups such as construction waste, metals, scrap, textiles and plastics. These material groups can contain different materials or waste products, such as polyethylene or plastic buckets in the material group plastic. The exception is "devices", because this group represents a mix of different products. The materials and waste (products) that make up the other 2% of the weight are very well defined by the interviewee. Examples are: thinner, cooking oil, brake fluid, aluminum, glue/resin mix and aerosols.

The material groups (plastic, wood type B, paper/cardboard) are frequently mentioned, both in number of companies and in weight. This could mean that the companies think in the classification terms used by the waste collectors. This may therefore mean that they are not familiar with the possibilities of separating some waste flows from a material group and having them processed separately. (for example cardboard boxes as part of the material group paper/cardboard or plastic barrels and buckets from the material group plastic).

The less mentioned but specifically mentioned materials and waste (products) such as, for example (styrofoam, frying oil, fire extinguishers, inkjet cartridges). These flows have been identified by 10 companies or less and represent a volume of less than 3%.

Only a few SME's could provide information about fluctuations in the volume or weight of their waste. This can be caused by a lack of insight into, for example, when these materials are created or how full the bins are when they are emptied. A significant fluctuation (>1%) of a material in the top 10 in tonnage was found on plastic, namely 19%.

8.4. Cost and collectors

One cost price is given for every 4.5 waste stream specified. Prices were quoted 5 times for residual waste and paper/cardboard. Prices were quoted less than 5 times for 11 other materials. Examples include glass, blasting grit, automotive fluids and plastics. Each of these materials represents less than 1% of the weight of all materials found. The specified costs can be used when calculating upcycle business cases.

The waste costs were therefore mentioned relatively little. Of the 54 different types of materials and products found, the costs of only 13 different materials were passed on. This can be explained because the interviewees who do not want to give prices or because the interviewee does not know exactly how much disposal of their waste materials and products costs. This may also be caused by the fact that the right person was not asked about this and because these costs were not submitted later, despite repeated requests.

The names of the seven waste streams in the weight top 10 are as used by waste collectors. Of only 3 of these flows (paper/cardboard, plastic and residual waste), more than 4 names of collectors were mentioned. For two of these materials, two collectors were mentioned ten or more times. This indicates that scale in collection is important.

We see an enormous variation in waste costs. For residual waste and paperboard, the difference between the highest (without peaks) and lowest costs was €346/ton and €642/ton respectively. It is to be expected that this will be the case with more waste streams.

8.5. Potential in streams

The interviewees see potential in separating more fractions from the residual waste stream. The most frequently mentioned fraction (25%) is plastic. Nine materials were mentioned two or three times and 10 materials and waste (products) only once. The great variety of potentially separable waste flows means that entrepreneurs apparently see many possibilities and potential for this, but that insofar as the waste flows do not resemble flows that they already separate internally, new solutions must be realised.

The interviewees also see opportunities for separating more streams from already separated streams. A wide variety of 18 potential materials is given, such as cardboard boxes and pallets. Most of the answers were given only once, such as plastic wrap, rests of cables, vegetables & fruit, and wood saw dust. These answers indicate that the interviewees are interested in separating more and put this in perspective of their own waste.

8.6. Impression of the interviewees

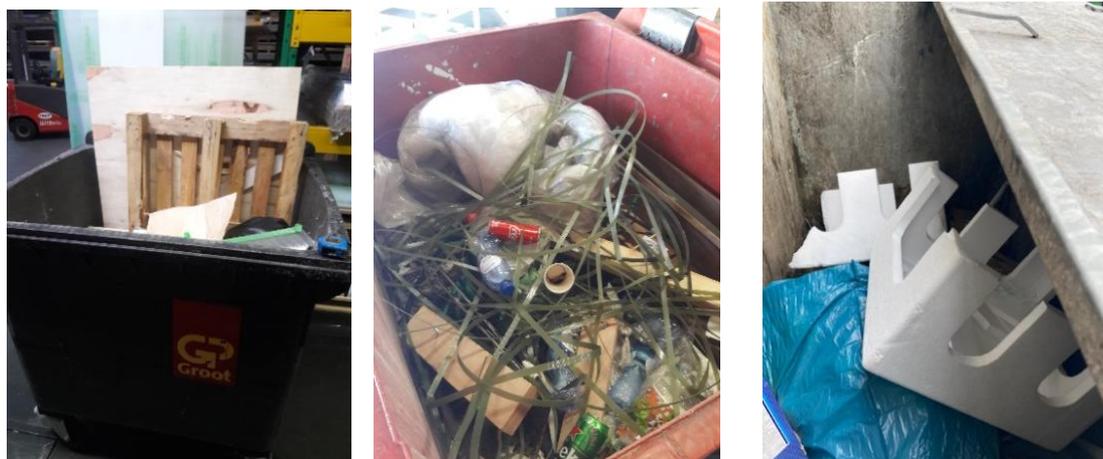
About 2 out of 3 of the interviewed companies wanted to be kept informed about the project, and almost about half wanted to receive a newsletter. The overall impression of the interviewed companies is that they are interested in the products of UYW.

8.7. Impression of the interviewers

In addition to the found data we also want to reflect the impression of the interviewers. This provides an additional and expert opinion on the current waste management practice of

the interviewed SMEs which is probably representative for most SMEs in the pilot area and the city of The Hague as well.

Due to Covid-19 measures, only 25 companies could be visited. During these visits pictures were taken. The pictures show waste ending up in the residual bin which should and could be separated, sometimes even if a separate bin for those waste stream was located directly next to it. Sometimes however also because waste companies do not collect small streams of separated waste. The impression is that the degree of separation can be improved by 10 to 20%.



Photos: Pictures of waste at companies on ZKD business area in Den Haag

Furthermore, a lot of companies could not tell the interviewers if the bins were full or half full or otherwise when being emptied. If asked for the waste costs a lot of companies were not aware of what they are paying or how their invoice was composed. (rent, emptying, processing). If an invoice was handed over it often shows only one figure, most invoices were not split up in different cost components.

During the visits, the interviewers found that many entrepreneurs have specific waste flows as mentioned earlier. They specified them as residual waste, but did not as separate and separable flows. This is unfortunate and could indicate (lack of) knowledge and lack of insight of entrepreneurs or perhaps their waste collector is not collecting them as separate streams and they therefore put them in the residual bin.

At the same time, this observation also indicates that there is a greater potential for re-/or upcycling than the numbers indicate. Example: Spent coffee grounds is mentioned ones. From the visits can be derived that at least 10-15 of the visited companies (30 of the total) have spent coffee grounds. Currently this is deposited in the residual bin. But can be upcycled in many different ways, for instance to grow mushrooms.



9. Conclusions and recommendations

9.1. Conclusions

In Den Haag 81 companies were interviewed, of which 34 were micro companies (less than 10 FTE) and 30 were 10+ SMEs. Offices, production, trade and car Branche companies were most represented in the scans. For 10+ SMEs also a lot of food were scanned. Most of the interviewees were owners or managers.

The participating 81 companies totally recorded 7,507 ton/year. In weight the most mentioned types of waste materials and waste(d) products are wood type B (3.607 ton/yr), residual waste (1.686 ton/yr) and paper/cardboard (1.105 ton/yr).

The other materials, more specified, represent 14% of the overall weight. Because these waste materials and waste(d) products are more specific it makes it easier to determine if re-/upcycling is possible. Because a lot of SMEs are lacking the knowledge for this, the UyW project could provide this assistance.

Interviewees provided a list of various materials and products that could potentially be separated from their residual waste and from their already separated waste. This was confirmed by the interviewers based on their visit to about 30% of the participating companies. Furthermore, the interviewers noted that a lot of specific waste streams are not specified by the SMEs although they present in the companies. Entrepreneurs just are not aware that additional separation could save them money. Therefore, the potential for waste separation is probably higher than can be derived from the figures in the scans.

Many interviewees did not provide (or know) information on the costs of removing discarded materials or products. The given costs for waste disposal show a large variation in costs, for instance 346 €/ton and 642 €/ton for respectively residual waste and paper/cardboard. It is to be expected that this is the case for more waste streams. It is therefore possible for some companies to save a lot of money by selecting a new waste collector.

It is expected that at least 10 - 20% of the waste flows that now end up as residual waste are recyclable and can be processed as recycled waste. This concerns, for example, wood, paper and cardboard, plastics, organic material and swill. In addition, waste(d) products, such as boxes, crates, pallets and similar products can be removed from the residual waste and sold or traded. The total improvement efficiency is estimated at 15 to 25%.

9.2. Recommendations

There are many opportunities for entrepreneurs to deal more efficiently and cost-effectively with their raw materials, waste and waste(d) products. This will not only lead to a significant improvement in the utilization of raw materials and reduction of waste and wasted materials as well as an increase of the recycling and upcycling percentage (total improvement efficiency approximately 15 to 25%), but also lead to significant cost savings or even revenues if waste products can be sold as second-hand products. In short, there is a world to win for entrepreneurs.

The UyW project has built up specific knowledge about waste management and has developed tools to meet the needs of SMEs. By using the waste management guide and

training module, waste separation can be greatly improved and reuse and upcycling of waste streams and products can be increased. Within the project, this help can be offered in a very concrete and targeted manner.

Furthermore, the UyW project can assist companies in selecting a new waste contractor in order to realize lower waste costs and can assist the participants in finding buyers for waste(d) products or perhaps second-hand use and finding re-/upcyclers for their specified and additionally identified waste streams.

Appendices

Appendix A: waste scan questionnaire

The questionnaire for the waste scan contained the following questions:

- What types of separate collected waste and residual products, and other residual material do you have? Examples: residual waste, old paper and cardboard, plastics, organics. This list is to be found in the appendix of the report “Methodology for waste scan and analysis”.
- How much of what type? How many bins per month are emptied, litres per bin, see waste bin overview or kg/month; also ask if the bins are $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or completely full)
- Do you know how much of what type per year? This question is for the materials that leave the company once per year as for example furniture or computers.
- Are there any seasonal fluctuations? Some materials are in some months more discarded as in others. Example is green waste as grass, in the summer months there is more than in the winter months.
- What are the costs? (cost per bin per week or month, or cost per ton or kg)
- Who collects your waste and residual material? (name of waste collector or recycler)
- What are the materials or products you have in the residual bin that could be separated?
- What are the materials or products you have in the already separated waste?



Appendix B. Bulk densities of residual materials

Material	Specific bulk densities (kg/m ³)
Building and demolition waste (Unsorted)	360
Cardboard	80
Commercial waste Unsorted	150
EPS	12,5
Fats	550
Fats from chip shops, restaurants	900
Fruit Vegetable Garden waste	450
Glass, mixed	300
Glass, window	1,200
Green waste (park waste, branches, grass etc.)	300
Gypsum waste	600
Metal; ferro	400
Metal; non ferro	400
Office paper	400
Paper/cardboard mixed	120
Plastic foil, clean	50
Plastic foil, not clean	60
Plastic waste; other	50
PMD (Plastic, Metal, Drinking Cardboard).	35
Stone debris	1,000
Swill (restaurant food waste)	1,000
Textile	250
Wood	300
Wood; saw dust	300

Appendix C: List of materials given in weight per year

Material	Amount (ton/year)	Percentage (%)	Number of companies
Wood type B	3,672	48.92%	2
Residual (mixed waste)	1,686	22.46%	67
Paper/cardboard	1,105	14.72%	41
Appliances (e.g. washing machines, fridges etc.)	240	3.20%	1
Bulk waste	240	3.20%	1
Construction waste	173	2.30%	1
Metal and scrap iron	87	1.16%	7
Textile (clothes)	74	0.99%	1
Swill	40	0.53%	1
Plastics	39	0.51%	9
Organic waste	35	0.47%	2
Styrofoam	26	0.35%	1
Stone	24	0.32%	1
Food waste	17	0.23%	1
Glass	14	0.18%	6
Wood	11	0.15%	3
Cardboard	4.58	0.061%	2
Plastics mixed	3.33	0.044%	4
Thinner	2.39	0.032%	1
Frying oil	2.32	0.031%	2
Iron	2.00	0.027%	1
Brake fluid	1.96	0.026%	4
Oil filters	1.41	0.019%	1
Blast grit	1.20	0.016%	1
Aluminum	1.05	0.014%	2
Glue/resin mix	1.00	0.013%	1
Spray cans	0.69	0.009%	3
Fire distinguishers mix (no halon)	0.30	0.004%	1
Oil (machines)	0.30	0.004%	2
TL fixtures	0.30	0.004%	1
Toner/inkjet cartridges	0.30	0.004%	1
Contaminated steel	0.23	0.003%	1
Air filters	0.20	0.003%	1
Stainless steel	0.20	0.003%	1
Oil containing waste	0.11	0.001%	1
Paint/ink	0.10	0.001%	1
Acid based cleaning liquids	0.10	0.001%	1
Road salt	0.10	0.001%	1
Solvents mixed low halogen	0.09	0.001%	1
Cartridges	0.0010	0.00001%	1
Total weight	7,507		81

Products and materials	Amount (m ³ /year)	At number of companies
Fluorescent tubes and light and TL fixtures	19.1	2
Oil (machines)	15.9	7
Car batteries	10.4	6
Coolant	4.52	8
Car liquids	4.50	2
Car fuels	4.42	5
Chemicals	2.40	2
Chemical waste	0.158	2
Paint waste	0.015	2

Products at 10+SMEs	Amount (pieces/year)	At number of 10+SMEs
Car tires	3,360	5
Beverage glass bottles	360	2
pallets	24	2

