



Report

## Post-consumer PVC waste in EU 28+2 countries 2016

Elaborated for

VinylPlus  
Av. E. Van Nieuwenhuyse 4/3  
B-1160 Bruxelles



October 19, 2017

## About Conversio

**Conversio** is specialised in B2B research and consultancy and works almost 20 years in the field of plastic and PVC production, processing and waste management. They have been asked for a proposal by **VinylPlus** (development of concept, realisation of the research, analysis and reporting) in May 2017.

The following draft report shows an estimation of the European PVC plastic waste generation, recovery and recycling situation.

Your contact:

Conversio Market & Strategy GmbH  
Christoph Lindner  
Phone (+49) (0) 60 21 – 92199-91  
c.lindner@conversion-gmbh.com

## Introduction: Initial situation, target

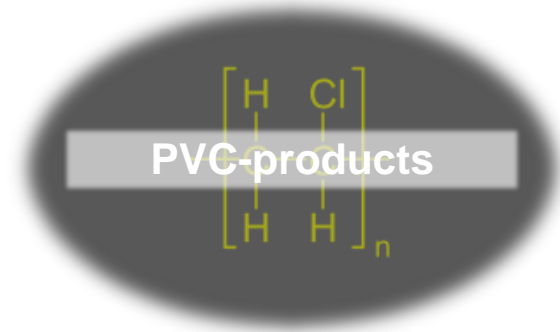
VinylPlus is faced by challenges regarding PVC waste generation, recycling and also export streams.

### The situation

The study “Post-consumer PVC waste in EU 28+2 countries 2016” was carried out as an update of the original study of 2013.

In a detailed breakdown post-consumer PVC waste from construction, packaging, ELV and WEEE waste generation, and the assessment of the quantities which are already mechanically recycled, energy recovered and disposed were major targets of the study. Also an assessment of PVC post consumer waste which is exported outside the EU 28+2 countries is part of the analysis.

As a supplement for the study - estimation of the PVC post-industrial (processing) waste generation, recovery and recycling is included.



## Project frame

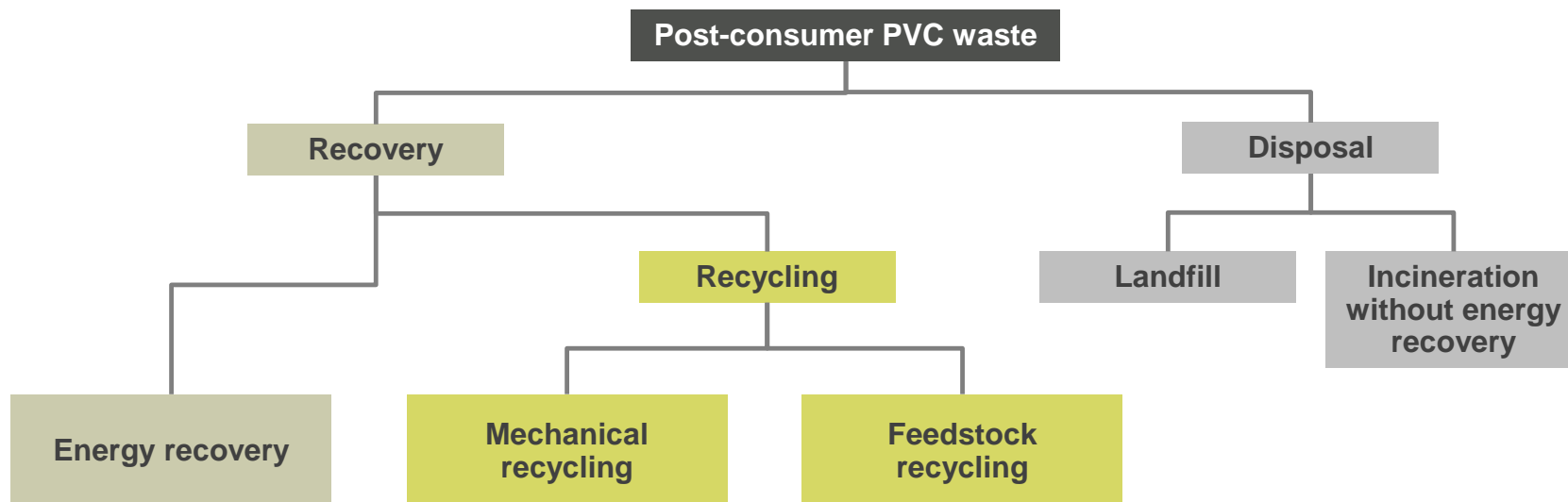
### Types and applications of PVC waste involved

- Plastic type: PVC (rigid and flexible, no differentiation)
- Applications: Construction, packaging, ELV (automotive), WEEE (electrical applications), others

### Regional frame: Countries involved

EU 28+2 countries (CH + Norway)

### Recovery and disposal streams of post-consumer PVC waste



## Methodology

**Kick-off telephone conference and discussion** about the actual situation, status of information and final targets of the study.

**Approach – general sources – secondary statistics – interviews – analysis – model**

**PVC post-consumer waste and recycling – General sources of data:**

- Internal Conversio data
- Collecting and recycling associations and institutions for the target applications
- Data collection and in-depth interviews with waste management and recycling companies
- Detailed analysis of the situation and the possibilities of the waste generating users (companies and households)
- Official federal waste and export statistics
- Analysis of specific production, demand and consumption data



# Methodology

## Sources Strategy

1. **Waste analysis**
2. **Demand of PVC in the target applications** as a basis and a “cross-check tool” for the assessment of PVC post-consumer waste  
(Sources: producers, associations, general statistics, Conversio data etc.)
3. **Calculations, e.g.**
  - analysis of products handled with PVC
4. **For cross-check purposes:** Interviews with ...
  - experts
  - waste companies
  - trade and transportation companies
  - etc.



## Methodology

### Definition of

- **Quantities**

The PVC waste quantities collected refer to the total waste quantity (compound = polymer + additive).

- **Post-consumer PVC waste**

Post-consumer waste means products collected after their usage (also short time usage). Included is also PVC waste from installation, assembly, fitting, laying etc. (e.g. pipes, cables, flooring, tarpaulins etc.) on construction sites.

- **Post-industrial waste**

*Post-industrial PVC waste is generated within the PVC converting respectively PVC product manufacturing process (the materials are normally homogenous, the ingredients are known).*



## Methodology

The PVC waste is differentiated in the following products categories (applications):



➤ **Packaging**

(e.g. food packaging, blister, transportation packaging, medical packaging, cling film, folded box, other packaging and packaging film)



➤ **Building & Construction**

(e.g. windows, doors, construction profiles, floor – and wall coverings, water proofing membranes, cables etc.)



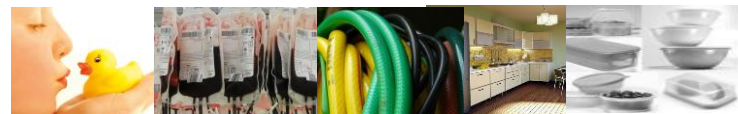
➤ **Automotive**

(e. g. instrument paneling coverings, seam sealant, underbody sealant, synthetic leather, cable, tarpaulins, door handle etc.)



➤ **Electro and Electronics (E+E)**

(e.g. cable, connectors, cable channel, housing, duct tape etc.)



➤ **Others**, e.g. houseware, furniture, medical products, gardening and agriculture, leisure products (primarily plasticized PVC products)

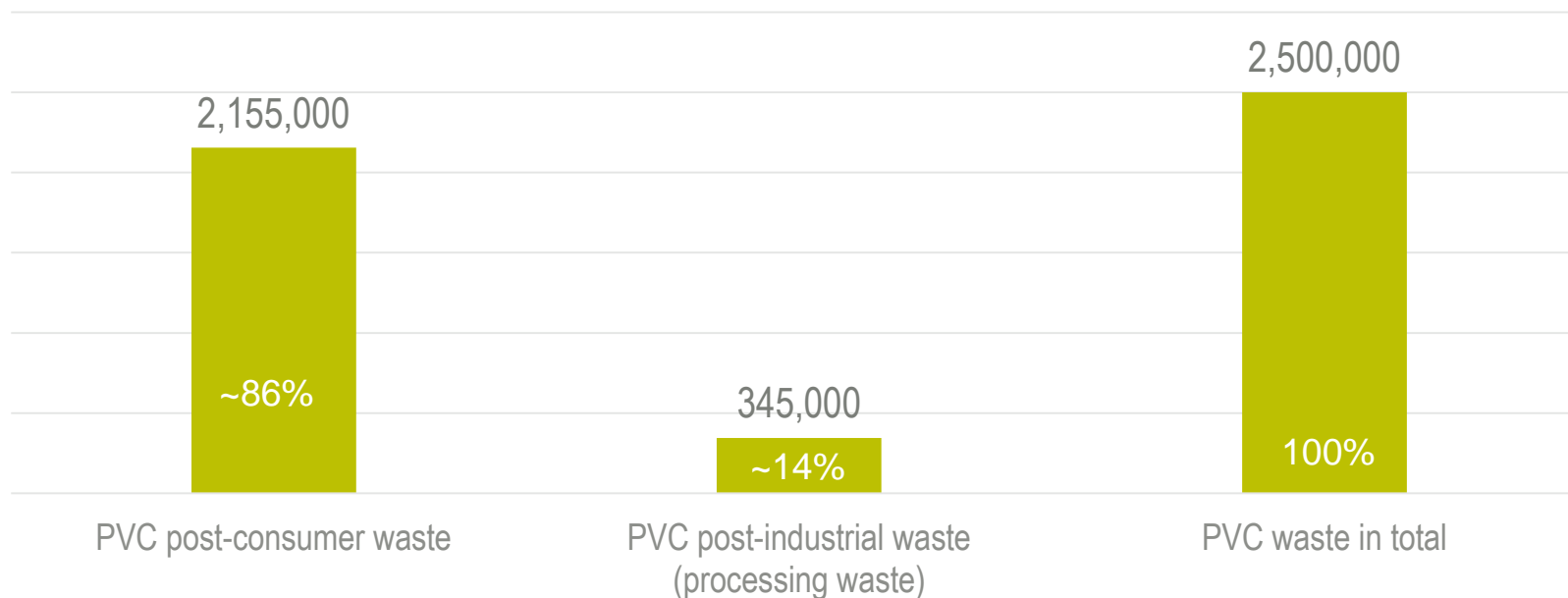


## Waste and recovery

### Total PVC waste generation

The total generation of PVC waste in Europe for 2016 was 2.500.000 tones. Thereof about 86% was post-consumer waste, ~14% post-industrial waste (processing waste).

PVC Waste Generation (in t)

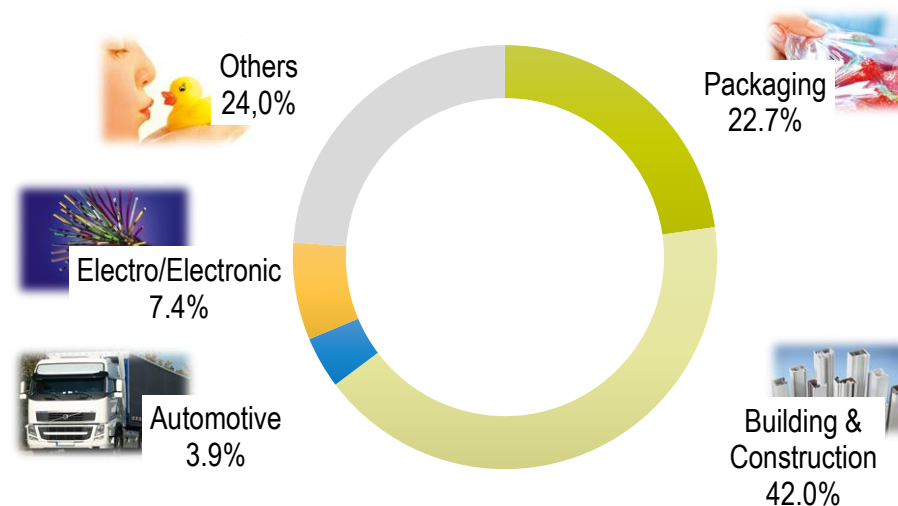


## Post-consumer waste generation by major applications

### PVC Post-consumer waste

Segments:	Post consumer waste 2016 in t	Rigid PVC in t	Flexible PVC in t
Packaging	490.000	325.000	165.000
Building & Construction	905.000	635.000	270.000
Automotive	85.000	25.000	60.000
Electro/Electronic	160.000	32.000	128.000
Others	515.000 t	365.000	150.000
<b>Total</b>	<b>2.155.000 t</b>	<b>1.382.000</b>	<b>773.000</b>

### Share of PVC post-consumer waste 2016



Most of the PVC post-consumer waste quantities were identified from the segments Building & Construction, followed by PVC waste from Packaging. The share of both applications is about 65%. It is also evident that the waste composition is mainly affected by the life time of the PVC products. Products with a short life time, e. g. packaging, can be identified in the waste stream more or less directly after their short-term usage.

Products with a long life time, e.g. windows, pipes, cables or floorings with a life span of often more than 50 years, can only be identified disproportional in the waste stream, compared to their consumption quantity. The share of rigid PVC waste within the PVC waste stream amounts to about 64% while the share of flexible PVC is about 36%.

## Post-consumer waste generation by major applications - 1

Applications 2016	PVC post-consumer waste generation		Recovery*						Disposal*	
			Total recovery		Mechanical recycling		Energy recovery			
	in kt	in %	in kt	in %	in kt	in %	in kt	in %	in kt	in %
Packaging	490	100%	355	72,4%	60 <sup>1)</sup>	12,2%	295	60,2%	135	27,6%
B&C	905	100%	660	72,9%	295	32,6%	365	40,3%	245	27,1%
Automotive	85	100%	52	61,2%	7	8,2%	45	52,9%	33	38,8%
E+E	160	100%	130	81,3%	75	46,9%	55	34,4%	30	18,8%
Others	515	100%	325	63,1%	55	10,7%	270	52,4%	190	36,9%
<b>Total</b>	<b>2.155</b>	<b>100%</b>	<b>1.522</b>	<b>70,6%</b>	<b>492</b>	<b>22,8%</b>	<b>1.030</b>	<b>47,8%</b>	<b>633</b>	<b>29,4%</b>

The table shows the following results:

- About 23% of the post-consumer PVC waste is recycled, thereof about 60% from Building & Construction sector, e. g. windows, doors, profiles, pipes and flooring. A substantial quantity is also coming from E+E (mainly cables). Drivers for recycling are B&C with a recycling rate of ~33% and E+E with about ~47%.
- Due to the fact that a predominant part of the post-consumer PVC waste is part of mixed waste streams as mixed construction waste or mixed commercial and industrial waste, a substantial quantity is also energy recovered (47,8%). About 29% are still landfilled. This means that energy recovery increased from 39% to almost 48%, while landfill decreased from 39% to almost 29,4% in 2016 compared to 2013.

\* Total recovery and disposal = 100%

<sup>1)</sup> Pls. refer to page 11

## Post-consumer waste generation by major applications - 2

1)

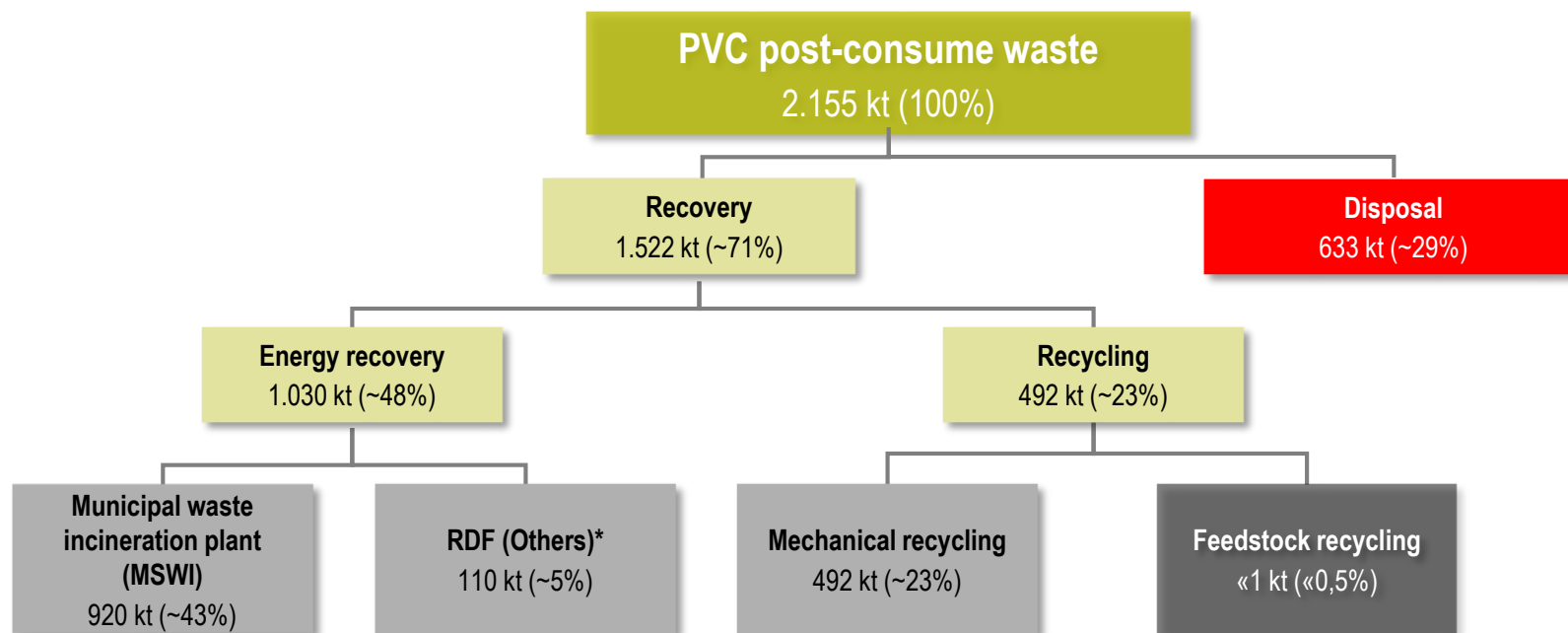
Recycling of PVC post-consumer packaging waste reached a level of about 60 kt.

In practise, PVC post-consumer waste is usually not sorted separately. But it has to be taken into consideration that almost 6.8 million tons of post-consumer packaging waste are recycled either within Europe or outside Europe, especially in Asia.

More than 50% are sorted and recycled by polymer type, e.g. PE-LD, PE-HD, PET etc. But significant quantities are also recycled as mixed plastics. Within this fraction a share of 2 – 3% PVC post-consumer packaging waste generates a recycling quantity of 60 kt.

## Total overview PVC waste

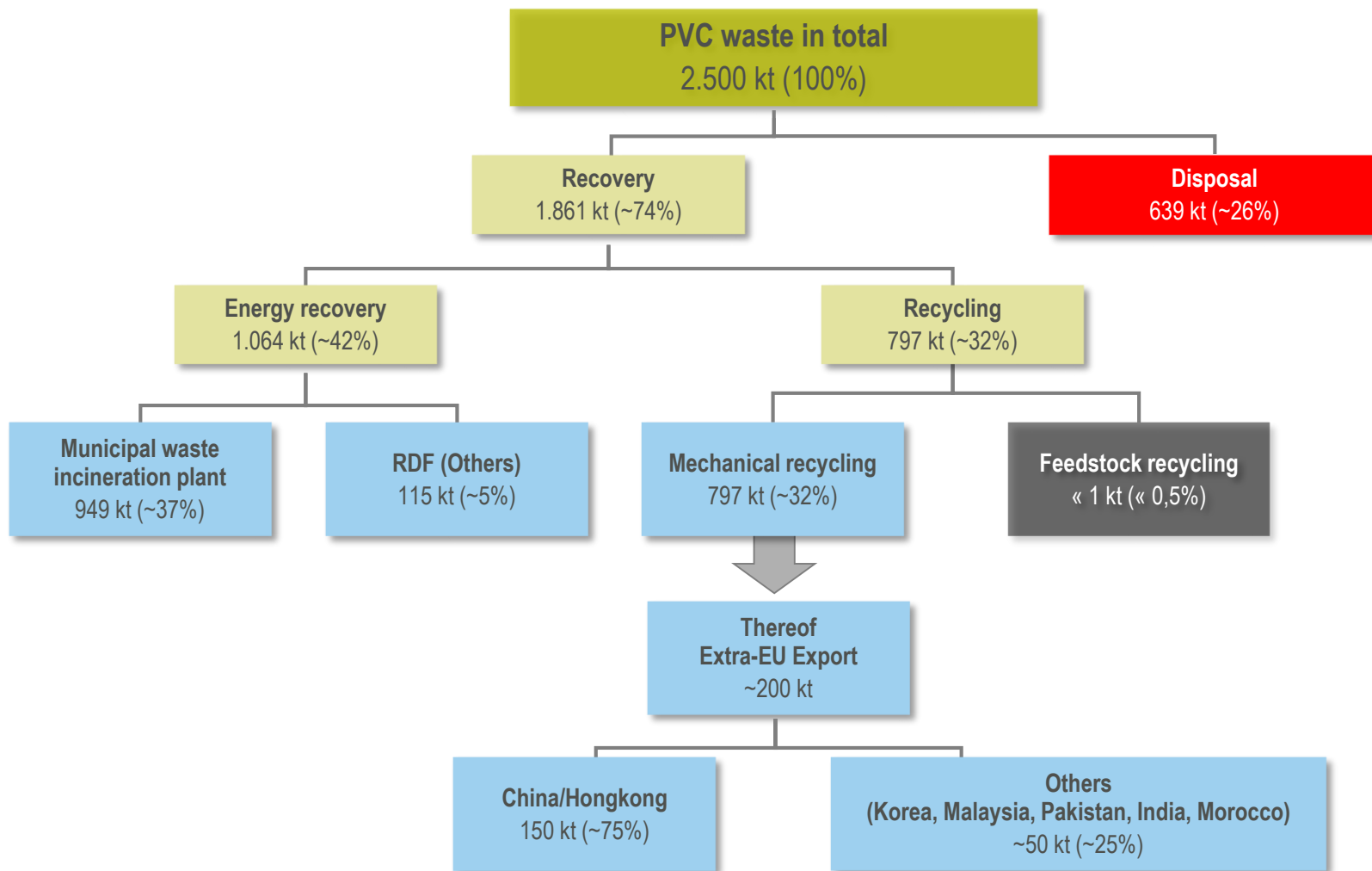
Almost 500 kt PVC post-consumer PVC waste was recycled in 2016



- More than 70% of the European PVC post-consumer waste was recovered in 2016, about 29% was still landfilled.
- Related to the total quantity, ~23% were recycled and 48% energy recovered.
- Energy recovery was mainly based on recovery in MSWI. Another - but significantly lower - quantity was also used in power plants or as waste derived fuel etc.

\* e. g. power plants and waste derived fuel

# Total overview PVC waste – including post-industrial waste – Recovery rate reached 75%



\* based on Eurostat data

## Total overview PVC waste – including post-industrial waste - 1

- Taking also post-industrial waste into consideration, the total quantity for PVC waste grew to 2,5 million t. Thereof 74% are recovered and 26% are still disposed.
- Focusing on recovery it is feasible that the recycling quantity rate rose to 797 kt or 32%. This means that around 305 kt of the recycling quantity is derived from post-industrial waste (processing waste) (492 kt + 305 kt = 797 kt).
- Only a minor additional quantity from the post-industrial waste was treated in energy recovery plants.
- The total PVC waste exported from the EU into Extra-EU 28 countries can be estimated to about 200 kt. The figures also include PVC waste from cables.
- Export of PVC waste outside EU is in general difficult to determine on a very detailed level, since the knowledge about the different applications is very limited or treated confidential by the traders.
- The export rate of PVC waste is primary based on export of post-consumer waste and is focused on Asian countries. Taking into consideration that the Hongkong material is finally mainly going to China, about 75% of the EXTRA EU Export is going to China.
- Further export target countries outside the EU 28+2 are Korea, Malaysia, India, Pakistan and Morocco.

## Total overview PVC waste – including post-industrial waste - 2

- Among others the export amount is driven through PVC cable waste. Besides cables the PVC waste mainly consists of products from the following applications:
  - Building & Construction  
(rigid: pipes, profiles, windows etc. / flexible: flooring, roofing, shutters, cables etc.)
  - Packaging (film)
  - Automotive
  - WEEE



## Appendix

- 1. Cables (slides 8 and 10)**  
Cables split into Building & Construction, E+E and Automotive
- 2. Pharmaceuticals (slides 8 and 10):**  
Pharmaceutical packaging is included in "packaging".
- 3. Definition post-industrial waste (slide 9) :**  
Mainly waste recycled outside, but also recycled in another facility or production line of the company.
- 4. Recycled amounts estimated at the input of recycling plants (slide 11)**
- 5. Exports are included in the mechanical recycling figures (slides 11 and 13)**

## Appendix

### 6. Definition of PVC waste included in the survey (slide 9)

#### Collected PVC plastic waste by households, commerce and industry

Post-consumer waste



Post-industrial waste

#### Main scope of the study

**Post-consumer waste** is subdivided into waste streams from private households and commerce (plastics waste collected by or on behalf of municipalities), as well as generated by economic activities such as manufacturing industry, construction, agriculture) and mainly collected by private waste management companies.

#### Side scope of the study

(Mainly waste recycled outside, but also recycled in another facility or production line of the company.)

## Appendix

### 7. Energy recovery: PVC waste for RDF (slide 12)

Remark: We do not consider to use separately collected PVC waste as feedstock for RDF applications. But we have to consider that more than 3 mio. tons of plastics are used in RDF plants European-wide within approximately 15 - 20 mio. tons of total waste. Therefore, PVC share would be less than 1%.

### 8. PVC in feedstock recycling (slide 13)

PVC in feedstock recycling is significantly less than 1 kt: If we assume that the material from the steel plant in Linz (blast furnaces), which is about 60 kt per year, contains 1% PVC (which doesn't cause any problems from the technical point of view), we achieve the quantity mentioned. (The material is mainly derived from packaging and to a minor extent from shredder residue.)

## References – experiences - why Conversio?

### Conversio activities in the plastics industry

- For more than 20 years, Conversio employees work in the field of statistics, marketing and consultancy of plastic production, processing and waste management/recycling.
- In this time we worked together with our partners in more than 100 projects. Bellow companies and institutions belong to our clientele, among others:
  - ✓ AgPU
  - ✓ Lyondell-Basell
  - ✓ BASF
  - ✓ Bayer/Covestro
  - ✓ BKV
  - ✓ BING
  - ✓ bvse
  - ✓ Borealis
  - ✓ Dow
  - ✓ EUMEPS
  - ✓ GKV
  - ✓ Henkel
  - ✓ Honeywell
  - ✓ Interseroh
  - ✓ Klöckner Pentaplast
  - ✓ KRV
  - ✓ Lindner-Recyclingtech
  - ✓ Rehau
  - ✓ Remondis
  - ✓ Rewindo
  - ✓ Sabic
  - ✓ Saint-Gobain
  - ✓ Schüco
  - ✓ Solvay/Solvin  
(Feasibility Study  
Vinyloop)
  - ✓ Tecpol
  - ✓ Total
  - ✓ UBA (Fed. Environmental Agency Germany)
  - ✓ Vinyl 2010/VinylPlus
  - ✓ FTI (Sweden)
  - ✓ EPRO

## References – experiences - why Conversio?

### Conversio Market & Strategy GmbH

- Through our international work we have excellent contacts to the European plastic and recycling industry and associations, e.g. PlasticsEurope, EUPC, EUPR and EPRO.
- We have closed contacts to the PVC and Profile industry and also to other involved groups as waste management companies and window manufacturers.
- Since more than seven years we analyse and supply the full data set for the European plastics industry along the value chain (production, converting/demand, waste, recycling and energy recovery)
- Our data and our methodology is well-known and accepted from the industry, the political institutions (e.g. environmental agencies and ministries, European Commission, e.g. with several citations in the Green Book) and even NGOs as NABU.

