



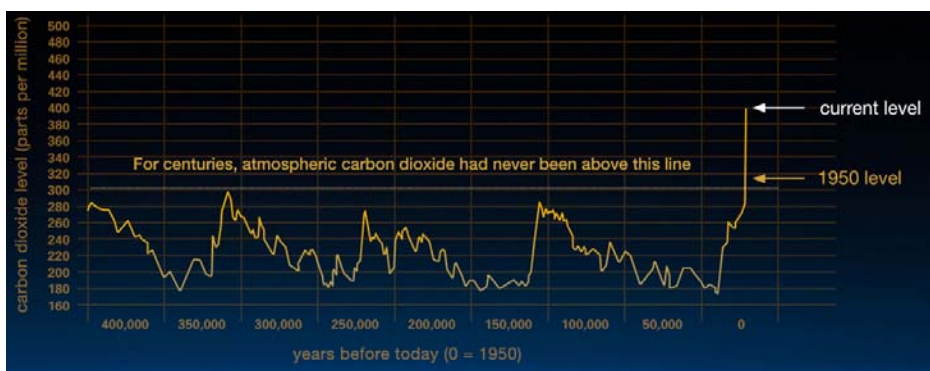
Waste & Chemicals in WEEE recycling

– Setting the right balance for a safe environment –



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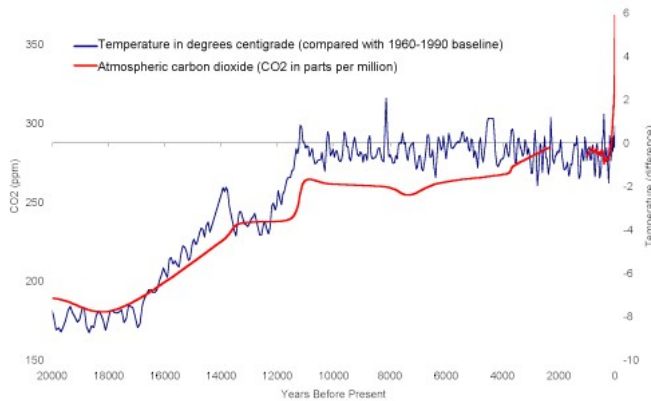
Exponential growth of an “invisible” Pollutant



https://climate.nasa.gov/climate_resources/24/

- ▶ Emitting CO₂ is free of charge
- ▶ It is a most urgent global environmental threat
- ▶ And.....this discussion decoupled from debates over toxics

CO₂ in the context of life on earth....



- ▶ Heat accumulates in seas
- ▶ Much less ice
- ▶ Rising sea levels

The last time the CO₂ level was this high:

- ▶ The global temperature was 6 degr. C higher
- ▶ Very little ice on the planet
- ▶ The sea level was 30 meters higher
- ▶ And....humans did not exist....

February 2017: 406,42 ppm CO₂

<http://www.climatecentral.org/news/the-last-time-co2-was-this-high-humans-didnt-exist-15938>

What can be done.....



- ▶ **Big companies CSR Reports** 1-2 MT CO₂ savings per employee and year
- ▶ **Private persons** 3-5 MT CO₂ savings per person and year
- ▶ **Recyclers** up to 1 000 MT CO₂ savings per employee and year



Recycling is a huge contributor to CO₂ emission savings

Recycling Process and hazardous substances



“Substances, preparations and components may be removed manually, mechanically or chemically, metallurgically with the result that hazardous substances, preparations, and components and those mentioned in Annex II are contained as an identifiable stream or identifiable part of a stream at the end of the treatment process. A substance, preparation or component is identifiable if it can be (is) monitored to prove environmentally safe treatment.”

May I invite you to have a look at our WEEE Recycling Process?

De-Pollution with Smasher 2.0

- ▶ **MGG Patented “Smasher”**
- ▶ **Taking out**
 - **Hazardous components, such as**
 - Capacitors > 25mm
 - Batteries
 - Toner Cartridges
 - **Valuable components, such as**
 - Printed Circuit Boards
 - Spools
 - E-Motors
 - **Disturbing fractions, such as**
 - Wood



EVA Shredder, specialized for WEEE



▶ Shredding

- Extremely efficient air treatment and fire fighting techniques
- Very low noise shredding

▶ Separation of Ferrous Metals

▶ Shredder residues

- Heavies
- Lights
- Dust fraction
- Clean air (approx. 2 mg/m³ dust)



Treatment of WEEE Shredder Residues



▶ Post-Shredder Technologies

▶ Many separation technologies:

- Size (sieving)
- Density separations
- Induction
- Colour & other sensor based
- Surface to weight ratio's etc.

▶ Resulting in concentrates of

- Non-Ferrous Metals (Cu, Al etc.)
- Printed circuit boards
- Plastics



MBA Polymers Plastics Recycling



► Goods-in and Pre-Processing

- Each receipt is assayed
- Pre-processing

► Separations and extrusion

- High-Tech Separations
- Blending and Extrusion
- REACH and RoHS PCR plastics

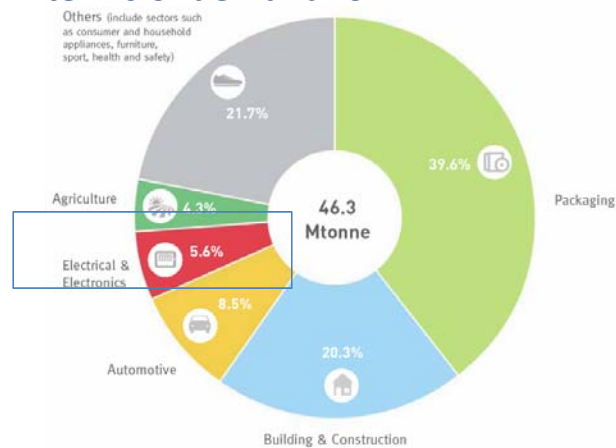
► Quality Controls

- Incoming goods
- Process controls
- Product quality control



“Forward” Approach

Plastics volume in terms of demand for EEE



European plastics demand* by segment 2013
 Source: PlasticsEurope (PEMRG) / Consultic / ECEBD
 * EU-27+NO/CH

The demand for EEE is approximately 2.5 Mio MT's

“Reverse” Approach

Estimating the quantity of plastics in WEEE



European Market	Mio MT	in %
Placed on Market (POM) EEE	9,50	
Officially reported collections/recycling	3,30	35%
Informal collections/recycling	3,20	34%
Exports (of which 1,3 Mio MT not documented)	1,50	16%
"Scavenging" for parts	0,75	8%
Losses (such as through waste bin)	0,75	8%



WEEE Plastics some 1,2 Mio Metric Tons

Plastic Content in WEEE per category

SDA	30%
LDA	15%
ICT	20%
Tools	10%
Temp Control Equipm.	25%
Screens	20%

Source CWIT – MBA Polymers

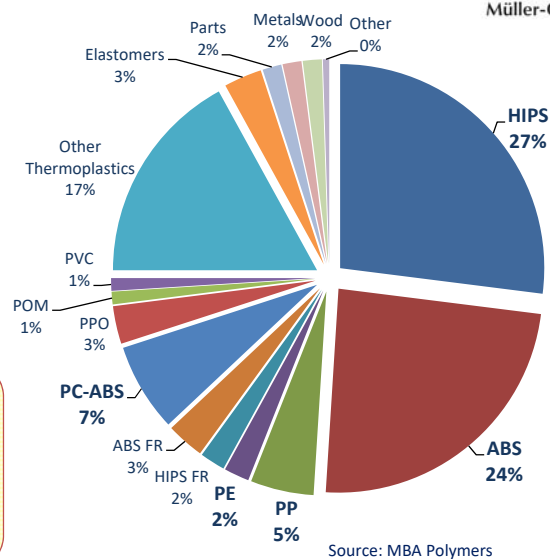
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Qualitative Approach

Average composition of WEEE plastics for recycling



WEEE Plastics	
ABS	24%
HIPS	27%
Polyolefines	7%
PC and PC-ABS	7%
Other plastics incl. BFR	29%
Parts and metals	4%
Other (mainly wood)	2%



Recycling WEEE Plastics at a yield of some 60 % has the potential of 2.5 Mio Metric Tons of CO₂ savings and this per annum. The equivalent of a 330 000 inh. city

Source: MBA Polymers

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Scientific Approach



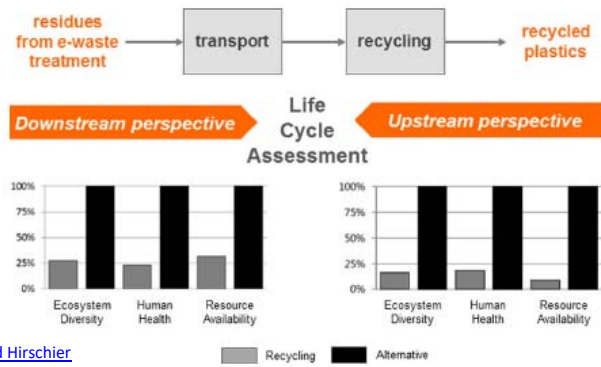
LCA PCR WEEE Plastic versus

1. Incineration of WEEE plastic and

Recycling PCR WEEE plastics 4 times better than Municipal Solid Waste Incineration

2. Production virgin plastics

Recycling PCR WEEE recycling option 6-10 times better than producing virgin plastics



Source: [Science of the Total Environment 529 \(2015\) 158–167, Patrick Wäger, Roland Hirscher](#)

If WEEE plastics recycling makes so much sense, why is there so little of it.....



- ▶ It is difficult.....

Separation of plastic is difficult

Metals

9	Copper	[Copper]
8	Brass	[Brass]
8	Steel	[Steel]
7		
6		
5	Titanium	[Titanium]
4		
3	Aluminium	[Aluminium]
2	Magnesium	[Magnesium]
1	Water	[Water]

WEEE Plastics

PPPE PS ABS nylon PET POM PVC
 SAN PPO f-PP PSU PC/ABS PU PPS PEI PMMA

Source: Mike Biddle, TED Talk 15

If WEEE plastics recycling makes so much sense, why is there so little of it.....

- ▶ It is difficult.....
- ▶ Most of the material disappears from Europe

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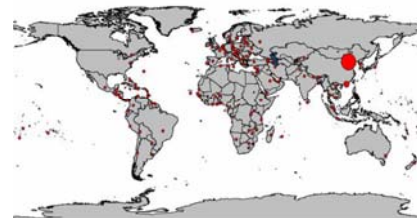
“The ways of plastics....”



The western Africa route



The China route



Resulting in losses of well over 1 Mio MT from the EU Urban WEEE Mine

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If WEEE plastics recycling makes so much sense, why is there so little of it.....

- ▶ It is difficult.....
- ▶ Most of the material disappears from Europe
- ▶ Very few companies invested in WEEE plastics recycling
 - Due to the losses of material from Europe
 - Ever increasing complexity of legislation



Let's look at Brominated Flame Retardants as example

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The complexity of the legal framework



- ▶ **UN Conventions**
 - Basel Convention -> transboundary shipments of waste
 - Stockholm Convention -> POP's
 - Rotterdam Convention -> hazardous substances & chemicals

- ▶ **EU Waste Legislation**
 - EU Waste Framework Directive
 - EU Waste Shipment Regulation
 - EU WEEE Directive

- ▶ **Product Legislation**
 - EU General Product Safety Directive (GPSD)
 - REACH Regulation
 - RoHS Directive for EEE

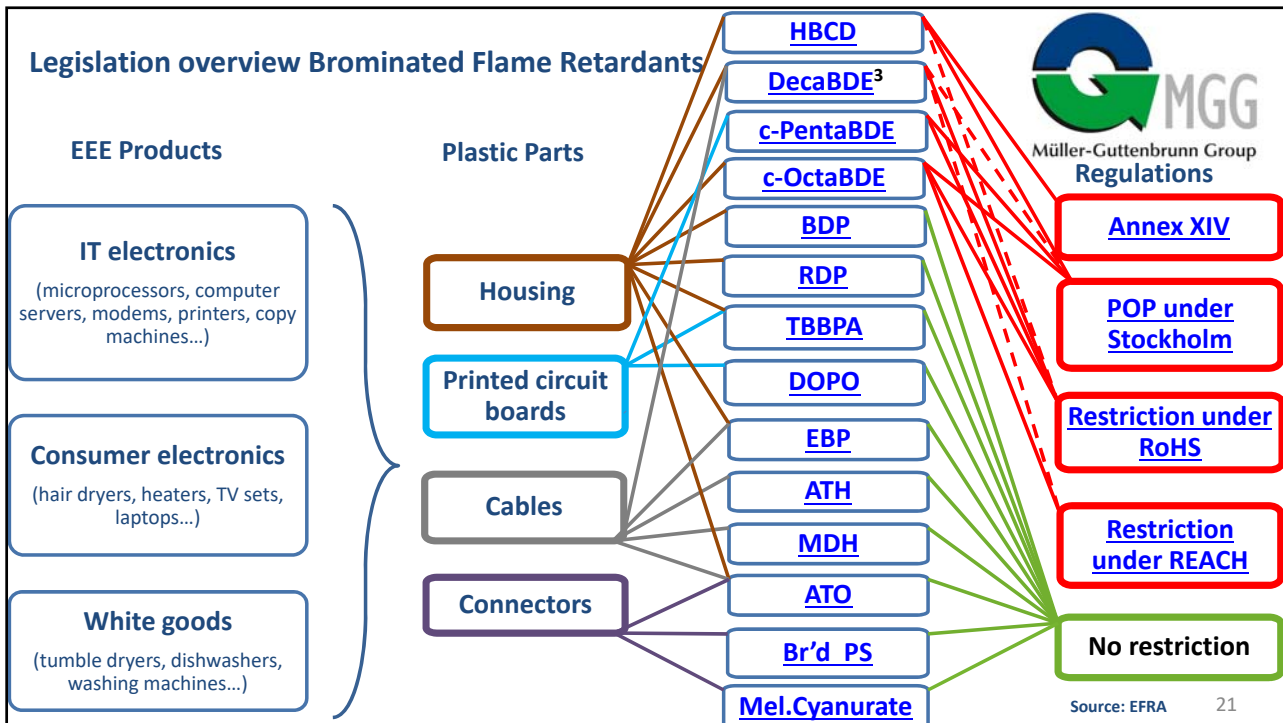
A continuous flow of new initiatives with potential impact to recyclers

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Many types of WEEE plastics.....



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Deca-BDE as example of this complexity

► RoHS 1 and 2 as well as WEEE Directive

- Discussions and decisions to stop using PBDE's in new EEE as from 2004
- De-pollution criteria (subsequently in standards such as WEEE Labex and Cenelec)

► Differing interpretations on classification of plastics with BFR's in WSR

- Original only refers to PBB's, but a number of CA's decided to include other BFR's

► Stockholm and Basel conventions COP May 2017

- Current discussions on POP-listing of deca-BDE (after penta-, octa-BDE, HBCD etc)
 - Proposals of thresholds of as low as 10-50 ppm (!)
 - Proposals of de-polution of plastics with PBDE's prior to recycling (!)

► REACH discussions on HBCD, Octa-, Penta, and Deca-BDE

Ever continuing discussions since 2004 creating legal uncertainties

The Environmental Canyon should be levelled out



And merge into a EU Environmental Roadmap to Circular Economy

