Plastics Labelling & Codification systems

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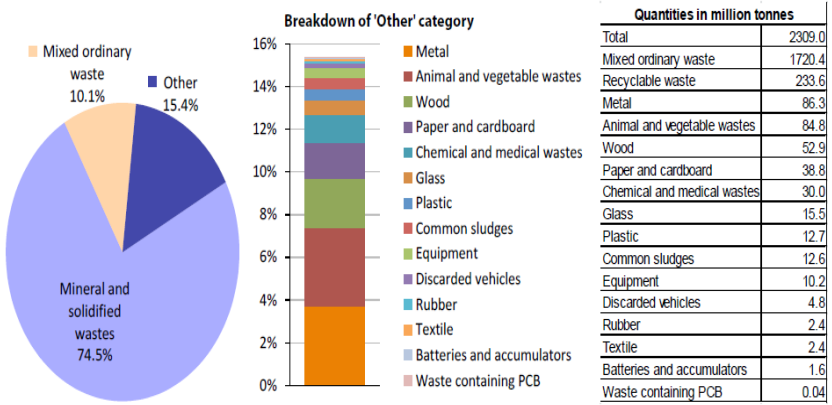
Waste streams

- Waste streams are flows of specific waste, from its source through to recovery, recycling or disposal.
- Two main categories:
  - Material-related streams (metals; glass; paper and cardboard; plastics; wood; rubber; textiles; bio-waste)
  - Product-related streams (packaging; electronic waste; batteries and accumulators; end-of-life vehicles; mining, construction and demolition waste).

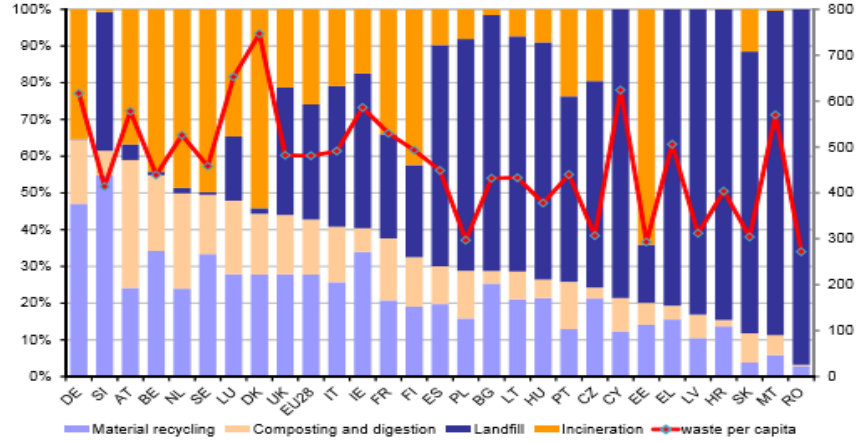
Figure 1 – Waste treatment by waste categories in EU28, 2012



Quantities in million tonnes	
Total	2309.0
Mixed ordinary waste	1720.4
Recyclable waste	233.6
Metal	86.3
Animal and vegetable wastes	84.8
Wood	52.9
Paper and cardboard	38.8
Chemical and medical wastes	30.0
Glass	15.5
Plastic	12.7
Common sludges	12.6
Equipment	10.2
Discarded vehicles	4.8
Rubber	2.4
Textile	2.4
Batteries and accumulators	1.6
Waste containing PCB	0.04

Data source: Eurostat (env_wastrt), 2015.

Figure 3 – Municipal waste treatment methods and waste per capita in EU-28 (2013)



Data source: Eurostat (env_wasmun), 2015.

Waste streams

- Waste Framework sets a priority order among five waste treatment methods:
  1) Prevention,
  2) Preparing for re-use
  3) Recycling
  4) Energy recovery
  5) Disposal
- The classification of waste is based on:
  - The European List of Waste (Commission Decision 2000/532/EC)
  - Annex III to Directive 2008/98/EC (consolidated version).

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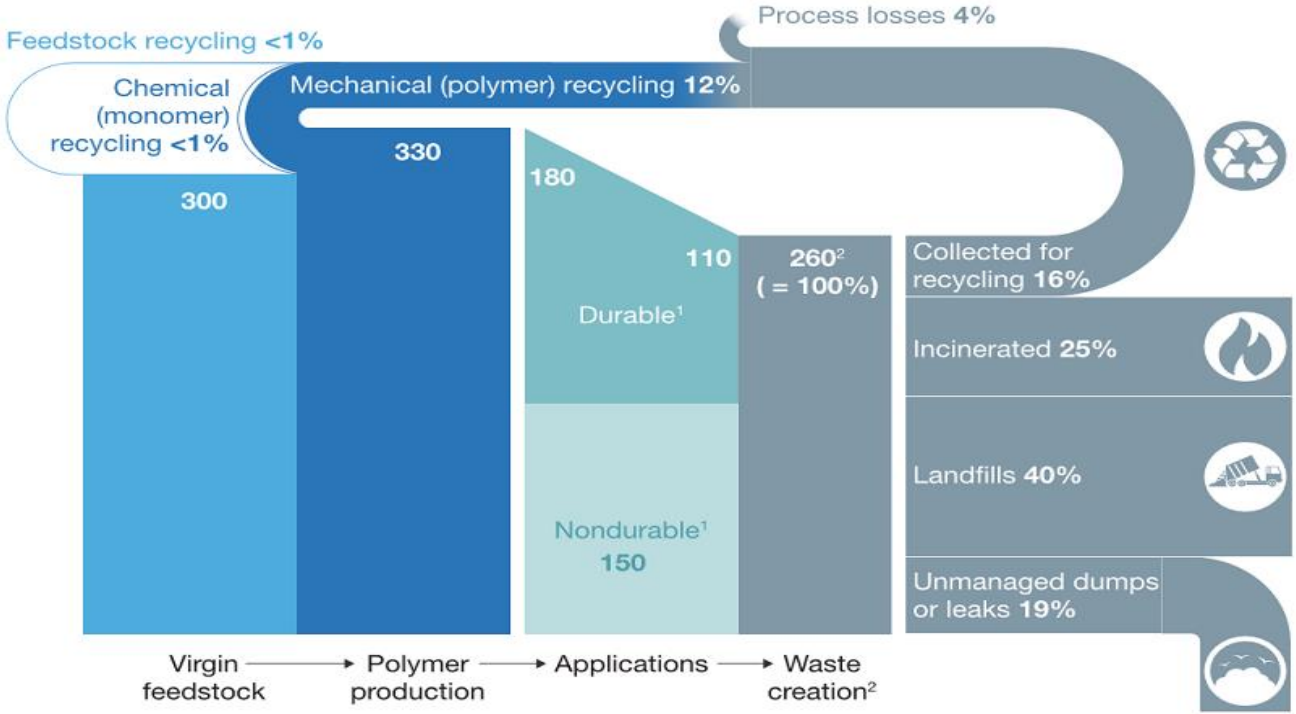
Global polymer flows, millions of metric tons per annum, 2016



¹Durable applications with an average lifetime >1 year will end up as waste only in later years; nondurable applications go straight to waste.
²150 million metric tons of mixed plastic waste from nondurable applications that end up as waste in same year, plus 110 million metric tons of mixed plastic waste from production in previous years.

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Plastic waste stream

- Products obtained from plastics recycling include synthetic textiles (duvets, fleeces), car parts (interior, bumpers), buildings (isolation), and packaging.
- Plastic waste treatment methods include:
  - Mechanical recycling (mainly for thermoplastics sorted in homogenous plastic type streams).
  - Energy recovery (making use of the high energy content of plastics compared to other waste).
  - Backfilling (construction).
  - Chemical recycling methods, using gasification or pyrolysis to break down plastics in synthetic gas and liquids, remain little used.

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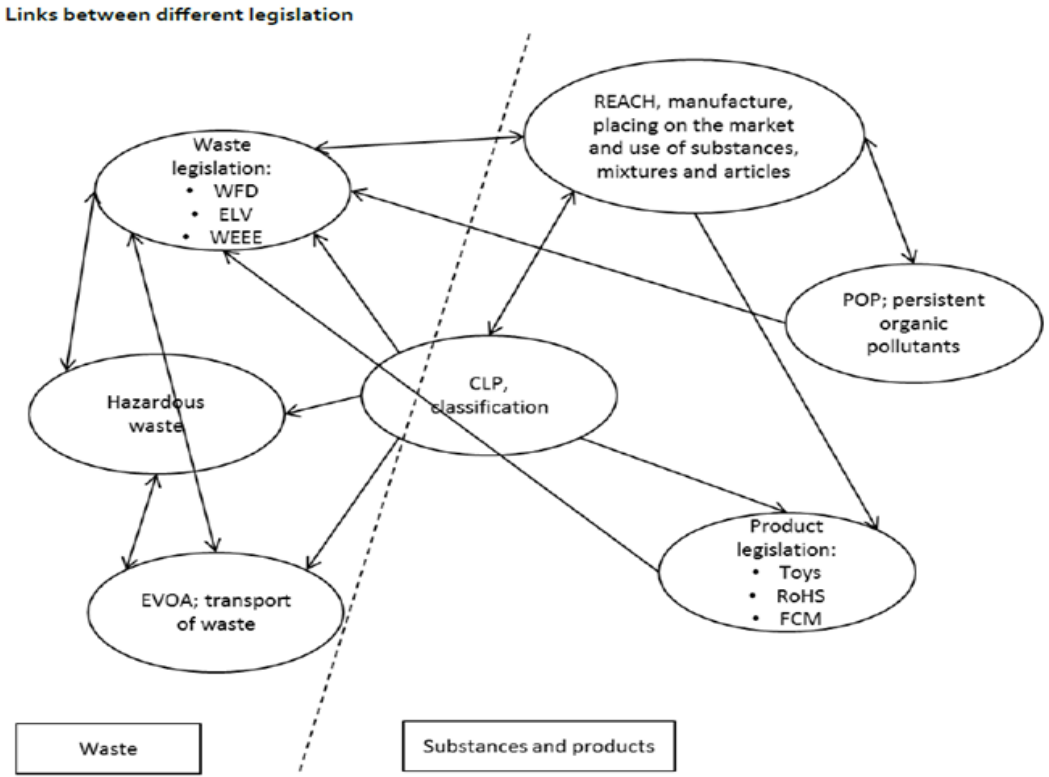
Plastic waste stream



Source: Janssen *et al.* 2016.

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How could we control all the different waste and materials streams??

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What is Labelling

- Labelling is a part of branding and enables product identification. It is a printed information that is bonded to the product for recognition and provides detailed information about the product.
- Types:
  - Brand label
  - Descriptive label
  - Grade label
- Functions
  - Defines the product and its contents
  - Recognition of product
  - Assorting of products
  - Assists promotion of products
  - In compliance with the law

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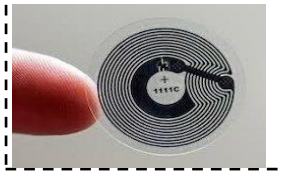
Smart Labelling System methodology

TYPES	DESCRIPTION	IMAGE
EAS LABELS	Electronic article surveillance is a technological method for preventing shoplifting from retail stores, pilferage of books from libraries or removal of properties from office buildings.	
RFID LABELS	Radio Frequency Identification is the wireless non-contact use of radio frequency waves to transfer data. Tagging items with RFID tags allows users to automatically and uniquely identify and track inventory and assets.	
SENSING LABELS	There are different types of these labels: Chemical Sensing Labels, Humidity Sensing Labels and Temperature Sensing Labels. These labels have a sensor which produces a response to a variation in the condition it is measuring (temperature, humidity, etc.). Usually they are used for food packing to be sure of the quality of the product.	
ELECTRONIC SHELF/DYNAMIC DISPLAY LABELS	An electronic shelf label system is used by retailers for displaying product pricing on shelves. The product pricing is automatically updated whenever a price is changed from a central control server.	
NFC TAGS	NFC, Near Field Communication, tags are small integrated circuits designed to store information that can be retrieved by NFC-enabled devices like the smartphones. They are small stickers, in round or square shape and are about the size of a large coin.	

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Codification systems for labelling

- Codification is used to properly classify equipment's, raw materials, components and spares to suit the particular needs of any organisation.

Objectives of Codification

- Accurate and logical identification
- Prevention of duplication
- Standardisation and reduction of varieties
- Efficient purchasing
- Efficient recording and accounting codes leads to effective stock control
- Easy locating, indexing and inspection of all materials is possible
- Easy computerization

Systems of Codification

- Alphabetic system,
- Simple numeric or sequence system,
- Combination system,
- Block system,
- Decimal system,
- Numerical system,
- Mnemonic system and
- Six letter – nine letter codes.

Codification Examples

NATO Codification System

Global standard for civilian and military cataloguing and material management.

The process of codification involves naming, classifying, describing the item and assignment of a 13-digit NATO Stock Number. The system aids logistics processes, to include supply, purchasing, maintenance, transportation, etc.

This policy has been domestically adopted by UK, Germany, Italy and Spain for the codification of Eurofighter Items of Supply.

Airbus Naming

Provides rules for coherent definition and application of Numbering and Naming requirements for aircraft functions and constituents. They have different standard for codification : Functions, Drawings, Specifications, Technical Design, Tools and Test, Equipment and more.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
L	**1**	**2**	**3**	**8**	**1**	**2**	**3**	**4**	**2**	**0**	**0**	**S**	**P**	**C**	**0**	**1**

! ! ! ! ! ! ! !
! ! ! ! ! ! ! Número de hoja
! ! ! ! ! ! Tipo de modelo
! ! ! ! ! Código de conjunto o elemental
! ! ! ! Número secuencial
! ! ! Código secuencial
! ! Subcapítulo ATA o tipo de parte
! Capítulo ATA
Código de avión

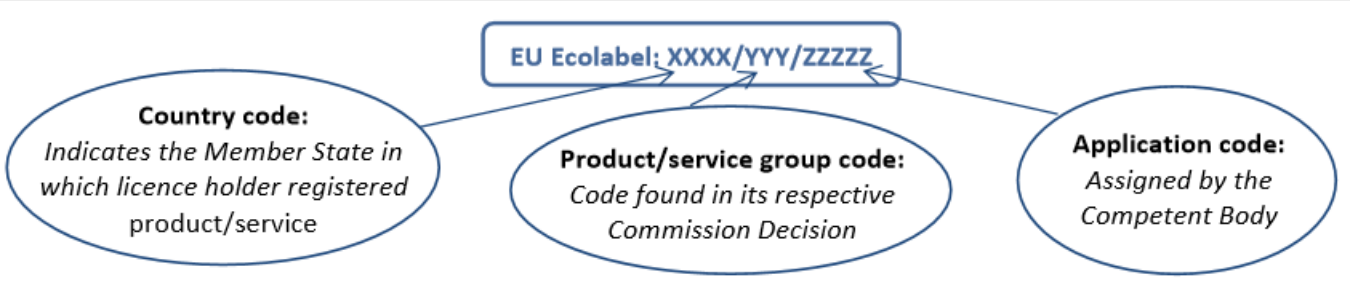
European labelling

- When a waste is correctly classified as hazardous, several important obligations are triggered, for instance on labelling and packaging, but also in terms of the available compliant treatment.
- The Classification Labelling Packaging Regulation sets out criteria for the hazard classification of substances and mixtures. Labelling is required when waste:
  - It is classified as hazardous.
  - It contains substances classified as hazardous above a certain threshold.
  - It has explosive properties.
- These obligations do not apply to WEEE or waste batteries until they are accepted for collection, disposal or recovery at a waste treatment facility.

Ecolabel

- The European Ecolabel, EU Ecolabel, was created in 1992 so that Europeans would know which products and services have the least negative impact on the environment and, in turn, support innovation and employment while respecting nature.

Today around 40,000 products and services carry the European Ecological Label (EEA), which means that they meet the strict EU ecological criteria. The label applications and licenses are managed by the national competent bodies.



Certification Schemes

- There are different certification schemes for the recycling products. Each country has a different certification disclose that the products offered are recycled or contain a percentage of recycled material.
- It is worth mentioning the **EuCertPlast** project which aimed to establish a European certification for post-consumer plastics recyclers. The EuCertPlast organisation has defined requirements based on the European Standard EN 15343:2007 and the purpose is to encourage recycling of plastics by using environmentally friendly practices, particularly focusing on the process for traceability and assessment of conformity and recycled content.

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Problematic

Sorting and material identification

- In 2016, from the 72.7% collected plastic waste only 31.1% got transformed. This is mainly because mechanical recycling (the most used recycling process for packaging in Europe) only works for pure plastic types like PET bottles.
- In Spain, 42.33% of the plastic packaging entering a sorting plant is rejected due to 2 main reasons: it cannot be recycled, or its composition cannot be identified.

The solution to improve material recycling percentage is

to achieve higher efficiency in recognising and sorting different plastic types.

Labelling could help to resolve this problem.

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Labelling for recyclers necessities

Plastics Identification process requirements

- Different requirements due to different technologies: Laser introduced break down spectroscopy (LIBS), Tribo-electric separation, X-ray fluorescence, Fourier transformed infrared technique (FTIR), Froth flotation method, Magnetic density separation or Hyper spectral imaging (HSI).
- Impurities.
- Machine requirements.

Recyclers requirements

- The most important characteristic recyclers need to know is the purity of the material and the impurities that are present in the waste.
- Machine requirements.

Labelling for recyclers necessities

Legislation for Identification & Codification:

- ISO 11469:2000 Plastics — Generic identification and marking of plastics products.
- EN 15343:2007 (Plastics. Recycled plastics. Plastics recycling traceability and assessment of conformity and recycled content) like EuCertPlast.
- EN 50625-1 Collection, Logistics & Treatment Requirements for WEEE

To ensure compliance with the EU, WTO and the Basel convention requirements, the adaptation must include traceability matrices, data management procedures and integration of incentives to attract waste recyclers, traders and dealers.

Labelling for end-users

- In addition to the needs of the recyclers in the recycling chain, when the recycled material leaves in the direction of its transformation to a new product, it is necessary to generate a label so that the producers of new compounds know the necessary properties of Recycled materials.
- The development of this label will give consumers a safety sense about the quality of the product, since there is still a lot of ignorance about recycled materials that prevents its use.

End-user specifications

- % materials (purity)
- Density
- Melt flow index
- Thermal conductivity
- Flammability
- Other mechanic properties

THANK YOU

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