Transition from Waste Management to Circular Economy

The EU Roadmap

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1. Circular Economy (CE) definition
2. The Role of Waste Management (WM)
3. The EU Action toward CE
4. EU Roadmap to Sustainable WM: 4 case –study analysis
5. EU Roadmap to CE: Circular Material Use rate analysis

Circular Economy (CE) definition

Limited resources

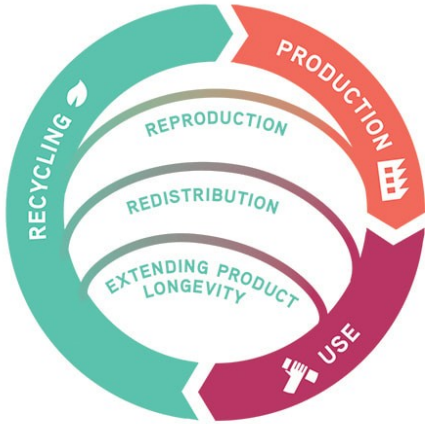
Limited possibilities to assimilate waste

Linear Economy

Resource depletion Increasing raw material prices

Waste accumulation Pollution

Circular Economy



Resources are saved after consumption and returned into production processes

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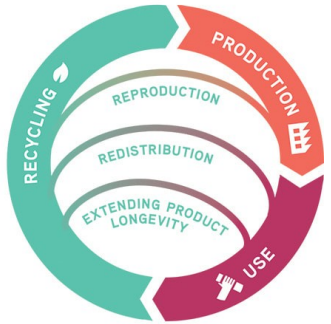
The Role of Waste Management (WM)

Linear Economy

Feedback loops Economy

Circular Economy



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Waste into new resources

- **Resource recovery** Enable to produce with recycled materials
- **Waste prevention** Limit the generation of waste

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The EU Action toward CE

The main guidelines

- The Roadmap to Resource-Efficient Europe
- The EU2020 Strategy
- The Seventh Environment Action Programme 'Living well with the limits of our planet'
- The CE Plan *"Closing the Loop: an EU Action Plan for the CE"*

KEY DIRECTIVES	KEY ACTIONS	
Directive on Waste Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC	• Handling of waste in compliance with the Waste Hierarchy • MS obligation to adopt WM plans (Art. 28 Dir 2008/98/EC) • MS obligation to adopt waste prevention programmes (Art. 29 Dir 2008/98/EC) • MSW targets for re-use and recycling (2025: 55%;	**WASTE PREVENTION AND TREATMENT**
Directive on packaging and packaging waste Directive (EU) 2018/ 852 of The European Parliament and of The Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste	• Support of Extended Producer Responsibility schemes • Introduction of packaging made with recycled materials (Art. 5 (1) Dir 2018/ 852) • Enhance recyclable packaging (e.g. with bio-based materials) (Art. 5 (1) Dir 2018/ 852)	**PACKAGING WASTE REDUCTION AND BETTER HANDLING**
. Directive on the landfill of waste Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste	• Restrict the landfill of waste separated collected. especially untreated bio-waste (Art. 5 (3) Dir 2018/850) • MS shall diminish the amount of MSW landfilled to less than 10% of the total amount of MSW generated by 2035 (Art. 5 (3)(a) Dir 2018/850)	**LANDFILLED WASTE REDUCTION AND SAFE DISPOSAL**

TWO-STEPS ANALYSIS

1

From Waste Management to Sustainable WM

4 case study considered: France, Italy, Germany, The Netherlands

Comparative Analysis on legislative measures for *municipal waste management*

Evaluation of performances, in the period 2004-2016, of:

- Waste generation
- Waste treatment
- Waste landfilled

Eurostat data

Waste legislation relevance to transform waste into Secondary Raw Material

2

From Sustainable WM to Circular Economy

4 case study considered: France, Italy, Germany, The Netherlands

Comparative Analysis on circularity through the Circular Material Use

SWM practices also favour circularity of resources?

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Case-studies analysis

FR

- 1992 **Waste Law No 92-646**
- 2009 **Grenelle I Law**
- 2010 **Grenelle II Law** (tax on incineration and landfilling TGAP)
- 2012 **Decree 2012/22 recycling targets for MSW**
- 2014 *National Waste Prevention Programme 2014-2020*
- 2015 **Law on Energy and Transition** (Law 2015-992)
- 2018 *Roadmap toward 100% Circular Economy "Feuille de route*

Total Waste generated in 2016
323 million tonnes

Total MSW generated in 2016
34 million tonnes

MSW recycled (% on total MSW generated) 42%		MSW incinerated (% on total MSW generated) 36%		MSW landfilled (% on total MSW generated) 23%
23% material recycling	18% Organic recycling	1% for disposal	35% for energy recovery	

DE

- 1991 the **Packaging Ordinance** (VerpackV)
- 1994 **Recycling Management** and **Waste Act**
- 2005 **Ban** for untreated MSW landfilling
- 2012 **German Circular Economy Act** (KrWG)
- 2013 National *Waste Prevention Programme* 2014-2020
- 2019 **Packaging Act** (VerpackG).

Total Waste generated in 2016
400 million tonnes

Total MSW generated in 2016
52, 133 million tonnes

MSW recycled (% on total MSW generated) 67%		MSW incinerated (% on total MSW generated) 32%		MSW landfilled (% on total MSW generated) 1%
49% material recycling	18% Organic recycling	5% for disposal	27% for energy recovery	

IT

- 1996 Landfill tax (**Law 549/1995**)
- 1997 The **Ronchi Decree** (Legislative Decree 22/97
- 2006 **Environmental Code** (Legislative Decree 152/2006) revised by Decree 205/2010
- 2013 National *Waste Prevention Programme* 2014-2020
- 2014 **Law 147/2013** waste tax TARI
- 2015 Collegato Ambientale (**Law n. 221** of December 28)
- 2017 Policy programme *Toward a model of CE for Italy*

Total Waste generated in 2016
164 million tonnes

Total MSW treated in 2016
27, 11 million tonnes
(the percentages are calculated on the quantity of MSW generated 30, 11 in 2016)

MSW recycled (% on total MSW generated) 46%		MSW incinerated (% on total MSW generated) 20%		MSW landfilled (% on total MSW generated) 25%
27% material recycling	19% Organic recycling	7% for disposal	13% for energy recovery	

NL

- 1994 *Lansnik's ladder* concept incorporated into legislation
- 1995 **Waste Decree** (landfill ban for waste categories + landfill tax)
- 2002 **Environmental Management Act** amended in 2008
- 2003 1st *National Waste Management Programme* (NWMP) (2002-2012)
- 2005 **Dutch Packaging Decree**
- 2009 2nd *NWMP* (2009- 2015)
- 2011 *Green Deal programmes*
- 2012 Elimination landfill tax
- 2014 Policy programme *Waste to Resource* (VANG)
- Reintroduction of the landfill tax
- 2016 Policy programme *A CE in the Netherlands 2050*
- 2017 **3rd NWMP** (2017-2023)

Total Waste generated in 2016
141 million tonnes

Total MSW generated in 2016
8,86 million tonnes

MSW recycled (% on total MSW generated) 53%		MSW incinerated (% on total MSW generated) 45%		MSW landfilled (% on total MSW generated) 2%
25% material recycling	28% Organic recycling	1% for disposal	44% for energy recovery	

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Circular Material Use (CMU)

Ratio that measures at macroeconomical level the «*share of material recovered and fed back into the economy - thus saving extraction of primary raw materials- on overall material use*». (Eurostat 2018)

$$CMU = \frac{U}{DMC+U} = \frac{RCV\_R - IMP_W + EXP_W}{DMC+(RCV\_R - IMP_W + EXP_W)}$$

U = input of domestic waste into recovery operations (excluding energy recovery and backfilling) minus imported waste destined for recovery, plus exported waste destined for recovery abroad

M = domestic material consumption plus U

Conclusions

France	Germany	Italy	The Netherlands
19.5%	11.4%	17.0%	29.0%

Generally, progresses on recycling are not enough for Resource Efficiency

EU economy appears still mostly ***output oriented*** (Domenech and Bahn-Walkowiak) need of policies focused also on reducing the input of resources.

NEW PRODUCTS' DESIGN APPROACHES:

- Products' recyclability since manufacturing;
- Use of regenerative sources and SRMs;
- Extension of products lives;
- Elimination of toxic materials.