Scenario of the plastic waste recycling
in Emilia Romagna Region (Italy)
as effort for the recent European Strategy for plastics
in a circular economy

Eleonora Foschi - PhD Student, Alessandra Bonoli - Professor

7th International Conference on Sustainable Solid Waste Management
26-29 June 2019, Aquila Atlantis Hotel, Heraklion, Crete Island, Greece
Context: TRIS project

The activity is carried out within the action plan of the Interreg project TRANSITION REGIONS TOWARDS INDUSTRIAL SYMBIOSIS.

And supported by:
Preface: The plastic value chain in a nutshell 1.4

PLASTIC PRODUCTION

# Preface: The plastic value chain in a nutshell

## PLASTICS CONVERSION

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building and construction</td>
<td>19.8%</td>
</tr>
<tr>
<td>Automotive</td>
<td>10.1%</td>
</tr>
<tr>
<td>Packaging</td>
<td>39.7%</td>
</tr>
<tr>
<td>Other</td>
<td>16.7%</td>
</tr>
<tr>
<td>Other</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

Source: Geyer et al. (2017), Production, use, and fate of all plastics ever made
Preface: The plastic value chain in a nutshell 3.4

PLASTIC WASTE MANAGEMENT

OECD (2018), Improving Plastics Management: Trends, policy responses, and the role of international co-operation and trade


Preface: The plastic value chain in a nutshell 4.4

Source: Jambeck et al. (2015), Marine pollution. Plastic waste inputs from land into the ocean
Mission: Circularizing the plastic value chain

1. PLASTIC PRODUCTS DISTRIBUTION
2. PLASTIC PRODUCTS CONSUMPTION
3. PLASTICS COMPOUND
4. PLASTIC WASTE COLLECTION
5. PLASTIC WASTE SORTING (per polymer and colour)
6. PLASTIC WASTE RECYCLING
7. PLASTICS RE-MANUFACTURING
8. ENERGY RECOVERY
9. LANDFILL
## The commitment of European Commission in the plastic fields

### CIRCULAR ECONOMY PACKAGE
- Separate collection for hazardous household waste (by end 2022), bio-waste (by end 2023), textiles (by end 2025).
- 65% of plastic packaging waste must be recycled by 2030;
- 70% of plastic packaging must be recycled by 2030

### EUROPEAN STRATEGY FOR PLASTICS IN A CIRCULAR ECONOMY
- More than half of plastics waste generated in Europe will be recycled by 2030
- Sorting and recycling capacity will increase fourfold since 2015 by 2030
- 77% of such single-use plastic beverage bottles must be collected separately by 2025
- 90% of such single-use plastic beverage bottles must be collected separately by 2029
- All plastics packaging placed on the EU market must be reusable or recycled in a cost-effective manner by 2030
- Secondary plastic market will increase fourfold since 2015 by 2030
- 25% of recycled plastics must be included in PET bottles by 2025
- 30% of recycled plastics must be included in PET bottles by 2030

### SUPs DIRECTIVE
- 65% of plastic packaging waste must be recycled by 2030;
- 70% of plastic packaging must be recycled by 2030
- Additional target: binding target to reduce landfill to maximum of 10% of municipal waste by 2035.
Multi-stakeholder analysis

INDUSTRY

NGOs and CIVIL COMMUNITY

POLICY
What’s the role of regions in promoting a circular plastic economy?
Case study: Emilia Romagna Region (Italy)

1a Describing the context

1b Setting priorities
Circular regional plastic value chain by valorizing the local recycling industry

1c Defining goals and strategy
Alignment of regional policy framework to the European Strategy on plastics in a circular economy

1d Planning and review
Regulatory framework: regional policy on waste

Regional law on circular economy

<table>
<thead>
<tr>
<th></th>
<th>Regional targets</th>
<th>European targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste reduction</td>
<td>20-25% by 2020</td>
<td>-</td>
</tr>
<tr>
<td>Separate collection</td>
<td>73% by 2020</td>
<td>77% by 2025, 90% by 2030 (for PET beverage bottles)</td>
</tr>
<tr>
<td>Municipal waste</td>
<td>70% by 2020</td>
<td>55% by 2025, 60% by 2030, 65% by 2035 (Calculation Method n.4)</td>
</tr>
<tr>
<td>Plastic packaging waste</td>
<td>65% by 2020</td>
<td>55% by 2030</td>
</tr>
<tr>
<td>Landfilling</td>
<td>5% by 2020</td>
<td>10% by 2030</td>
</tr>
</tbody>
</table>

Regional plan on waste management

Permanent table on by-products valorization
Regional list of by-products

Permanent forum “Chiudi il cerchiot
Living lab on circular economy and industrial symbiosis
Material framework: plastics in regional waste streams

- Plastic packaging waste coming from residential activities
  - EWC 150102

- Plastic packaging waste coming from industrial and commercial activities and disposed in separate collection scheme
  - EWC 200139

- Plastic packaging waste coming from industrial and commercial activities
  - EWC 200139

- Plastic waste from mono material waste stream
  - EWC 020104
    - from agriculture
  - EWC 120105
    - from physical/mechanical treatment of plastics

- Plastic waste from multi material waste stream
  - EWC 160119
    - from B&C sector
  - EWC 170203
    - from EoL vehicles

- Plastic waste coming from mechanical treatment of waste
  - EWC 191204
Material framework: plastics waste management

PLASTIC WASTE MANAGEMENT

SPECIAL WASTE
- Framework of private enterprises
  - Independent consortia
    - PARI: LDPE flexible packaging
    - CORIPET: PET packaging for food beverage
    - CONIP: PO secondary and tertiary packaging
  - COREPLA Platforms
    - PIA: General packaging
    - PIFU: Drums and tanks
    - PEPS: PS packaging

MUNICIPAL WASTE
- Public/private waste collectors
- Public/private waste managers
  - COREPLA:
    - Pre-sorting plants (CC)
    - Sorting plants (CSS)
- Recycling companies

Framework of private enterprises

Public/private waste collectors

ORSO db

MUD db

Indipendent consortia
Plastic waste generation

Municipal waste

Special waste

27.7%

72.3%
Plastic waste treatment

The performance of plastic waste recycling depends on:

- **Recycling infrastructure**
- **Type of plastic materials and applications**

<table>
<thead>
<tr>
<th>TYPE OF WASTE STREAM</th>
<th>EWC</th>
<th>POLYMERIC COMPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKAGING</td>
<td>120105, 150102</td>
<td>PET, HDPE, LDPE, PP</td>
</tr>
<tr>
<td>AUTOMOTIVE</td>
<td>160119</td>
<td>PA, ABS, PP</td>
</tr>
<tr>
<td>B&amp;C</td>
<td>170203</td>
<td>PVC, HDPE</td>
</tr>
<tr>
<td>AGRICOLTURE</td>
<td>020104</td>
<td>LDPE, EVA</td>
</tr>
<tr>
<td>PLASTIC MANUFACTURING/RECYCLING</td>
<td>200139, 191204</td>
<td>All</td>
</tr>
</tbody>
</table>
Municipal plastic waste management: COREPLA

Plastic packaging recycling target (Directive 98/2008): 22.5% by weight, counting exclusively material that is recycled back into plastics.
Industrial plastic waste management

- EWC 1601
  - R1: 0.03%
  - R2-R12: 40.68%
  - R13: 55.50%
  - D1: 1: 19.18%
  - D1: 4: 12.95%
  - D1: 19: 65.89%

- EWC 120105
  - D15: 2.65%
  - D10: 0.07%
  - D1: 19: 0.63%
  - D1: 6: 18.84%
  - D1: 19: 69.76%

- EWC 020104
  - R1: 0.03%
  - R2-R12: 19.18%
  - R13: 19.18%
  - D1: 4: 0.07%
  - D1: 19: 12.95%

- EWC 170203
  - D1: 7: 5.20%
  - R1: 0.00%
  - R2-R12: 190.00%
  - D10: 0.08%
  - D2-D14: 84%
  - D1: 19: 45.55%
  - D1: 6: 42.79%
  - D1: 19: 17.69%

- EWC 191204
  - D1: 7: 5.20%
  - R1: 0.00%
  - R2-R12: 190.00%
  - D10: 0.08%
  - D2-D14: 84%
  - D1: 19: 45.55%
  - D1: 6: 42.79%
  - D1: 19: 17.69%

INDUSTRIAL PLASTIC WASTE

- EXPORT to other Italian regions
- EXPORT to global countries
Secondary plastic manufacturing

Secondary plastics by polymer type and shape

Plastic waste sorted by polymer type:
- HDPE: 10.80%
- LDPE: 10.80%
- LLDPE: 2,27%
- PVC: 1,59%
- PP: 22.23%
- PS: 0.20%
- ABS: 5,46%
- Plasmix: 0.03%
- Altro: 1.75%
- Plastiche miste a specifica Corepla: 1.64%
- Plastiche miste a libero mercato: 53.82%

Investigation at:

Regional sorting plants

Regional recycling plants

Graph showing the distribution of secondary plastics by polymer type and shape.
Conclusion: Towards the Strategy on plastics for circular economy

QUALITATIVE

Packaging waste: Reducing municipal waste (DRS, PAYT)
  Increasing awareness on plastics users (including consumers)
  Promoting servitization and design for recycling
  Recovering plastics from unseparated waste stream

C&D waste: Improving selective demolition

Automotive waste: Promoting the use of recycles and the design for disassembly

Agriculture: Promoting biocompostable plastics and efficient collection
  Investing in local recycling infrastructure

QUANTITATIVE

Monitoring industrial plastic waste

Harmonizing data collection and target calculation on waste recycling (Met. 4)

Introducing value-based circularity indicators
THANK YOU FOR THE ATTENTION!

Eng. Eleonora Foschi, PhD Student
eleonora.foschi3@unibo.it

Department of Civil, Chemical, Environmental and Materials Engineering