THE CIRCULARITY OF PLASTICS: INDUSTRIAL OPPORTUNITIES, INNOVATION AND ECONOMIC-OCCUPATIONAL BENEFITS FOR ITALY

Executive summary of the Strategic Report

Partner of the Study:

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September 2022

Strategic Report prepared by The European House - Ambrosetti for Federchimica – PlasticsEurope Italia, Federazione Gomma Plastica – Unionplast, Associazione nazionale costruttori di macchine e stampi per materie plastiche e gomma – Amaplast, Associazione Italiana Polistirene Espanso - AIPE, Associazione Nazionale Poliuretano Espanso Rigido - ANPE, PVC Forum Italia, COREPLA, Biorepack, Arkema, Basell Poliolefine Italia, BASF Italia, Borealis Italia, COIM, Covestro, Dow Italia, Ineos Italia, Radici Novacips, SABIC and Versalis.

The contents of this Report refer exclusively to the analysis and research work, represent the opinion of The European House - Ambrosetti.

INTRODUCTION

This Strategic Report was realised by The European House - Ambrosetti on behalf of the Partners of the initiative:

ASSOCIATIONS

- Federchimica – PlasticsEurope Italia
- Federazione Gomma Plastica – Unionplast
- Associazione nazionale costruttori di macchine e stampi per materie plastiche e gomma – Amaplast
- Associazione Italiana Polistirene Espanso – AIPE
- Associazione Nazionale Poliuretano Espanso Rigido – ANPE
- PVC Forum Italia

CONSORTIA

- COREPLA
- Biorepack

COMPANIES

- Arkema
- Basell Poliolefine Italia
- BASF Italia
- Borealis Italia
- COIM
- Covestro
- Dow Italia
- Ineos Italia
- Radici Novacips
- SABIC
- Versalis

The mission of the Strategic Report is the following:

> Defining a **strategic vision** outlining the role that plastics can play within the **Circular Economy** paradigm, highlighting its contribution to the **competitiveness** of the country

More specifically, the objectives of the Report can be summarised as:

- qualifying the **role of the plastics industry in supporting economic development** by enhancing the technological and manufacturing skills located in Italy;
- recognising and supporting the **value of industry innovation** to promote circularity in plastics;
- enhancing the contribution of a **'circular' approach** to the use of plastics for the development of the industry and for the protection of the environment,

demonstrating the associated concrete benefits and impacts on the competitiveness of the value chains and user and/or beneficiary sectors;

- presenting the **state of the art of plastic waste recycling and reuse** in Italy, qualifying its strategic function, current and prospective, and carry out a technological assessment of chemical recycling solutions;
- developing a **strategic vision** for Italy to accelerate and optimise development paths on the issues in question, indicating priorities, supporting policies and the roles of the actors involved.

The Report was supported by a Scientific Committee, consisting of:

- **Lidia Armelao** (Director, Department of Chemical Sciences and Materials Technology, National Research Council – CNR);
- **Alessandro Bratti** (Researcher, Department of Chemistry and Agricultural Sciences, University of Ferrara; former Director General, ISPRA);
- **Giorgio Metta** (Scientific Director, Italian Institute of Technology).

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- **Valeria Frittelloni** (Head of the National Centre for Waste and Circular Economy, ISPRA);
- **Alfredo Pini** (Director of the Department for Environmental Assessment, Monitoring and Sustainability, ISPRA).

We thank the representatives of the partner associations, consortia and companies:

- **Rita Anni** (Director, Associazione Nazionale Poliuretano Espanso Rigido – ANPE);
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- **Marco Bergaglio** (President, Federazione Gomma Plastica – Unionplast);
- **Filippo Bertacchini** (Head of Communications and Government Relations, BASF Italia);
- **Lorenzo Bottinelli** (Managing Director, BASF Italia; President, Federchimica – PlasticsEurope Italia);
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- **Carlo Ciotti** (President, PVC Forum Italia);
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- **Francesca De Sanctis** (Spokesperson, Biorepack);
- **Luigi Gerolla** (Chief Executive Officer, Radici Group Chemicals & Plastics);
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- **Alessandro Passerini** (General Manager EMEA, COIM);
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- **Giorgio Quagliolo** (President, COREPLA);
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- **Noemi Sutera** (Communication Manager, Federchimica – PlasticsEurope Italia);
- **Marco Versari** (President, Biorepack).

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- **Stefano Besseghini** (President, ARERA);
- **Luca Dal Fabbro** (Chairman, Iren Group; Vice-President, Circular Economy Network; Chairman, ESG European Institute);
- **Luca Mariotto** (Director Environment Sector, Utilitalia);
- **Angelo Salsi** (Head of the Department on Natural resources, climate, sustainable blue economy and clean energy, European Climate, Environment and Infrastructure Executive Agency);
- **Monica Tommasi** (President, Amici della Terra).

The contents of this report refer only to the analytical and research work represent the opinion of The European House - Ambrosetti and may not coincide with the opinions and views of the people involved.

The European House - Ambrosetti working group consists of:

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- **Ines Lundra** (Assistant).

THE TEN KEY MESSAGES OF THE STRATEGIC REPORT

1. In Italy, the plastics industry generated in 2020 45.8 billion Euros in turnover (4.7% of total manufacturing), 12.7 billion Euros in Value Added (5.1% of total manufacturing) and 19.9 billion of Euros in exports (4.9% of total manufacturing), employing around 180,000 people.

Plastic production worldwide increased by **9.6%** over the last five years, from 335 million tonnes in 2016 to **367 million tonnes** in 2020. In contrast, an opposite trend can be observed in **Europe**, where plastic production **decreased by -8.3%** over the same period. These trends led to a reduction of the share of global plastic production in Europe, from 17.9% in 2016 to **14.9%** in 2020. As of today, China is the 1st producing country, with a market share of **32%** globally.

With reference to the Italian context, for the purposes of this Report, in order to reconstruct the plastics value chain, the **extraction and refining of oil** and the **cracking of its derivatives** have not been included in the scope of the analysis, as it is an activity that also crosses other sectors and therefore not explicitly (and exclusively) referable to the plastics value chain. Therefore, the analysis – and consequent reconstruction – of the plastics value chain covered the other **three phases**: **production**, **transformation** and **end-of-life and material recovery**.

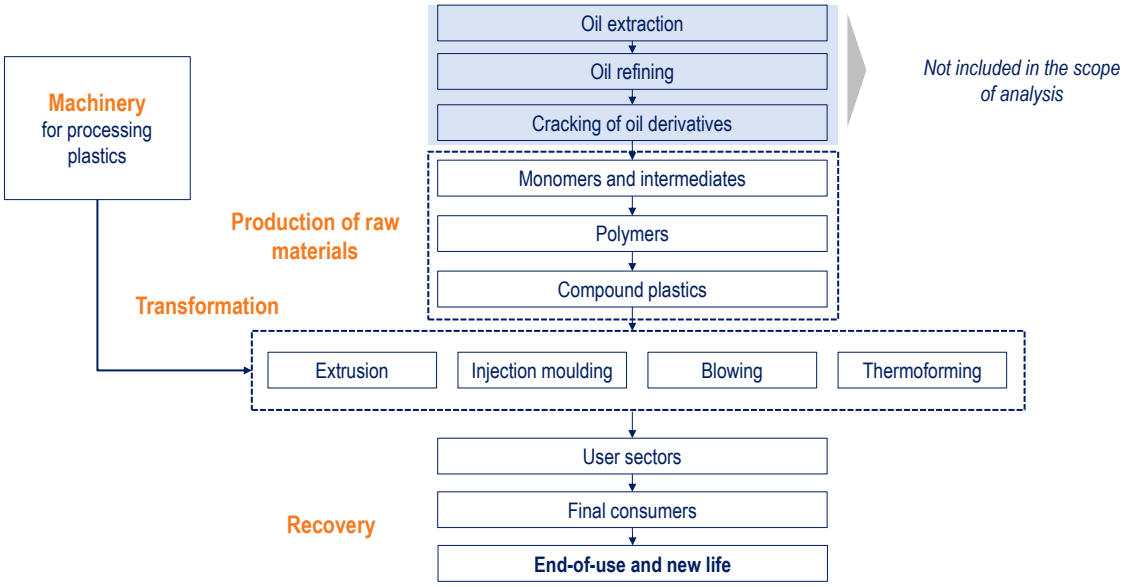

Figure I. The perimeter of the plastics value chain considered in the Report. *Source: The European House - Ambrosetti elaboration on various sources, 2022.*

In Italy, the plastics industry[1] generated **45.8 billion Euros in turnover** in 2020 (**4.7%** of the total Italian manufacturing), **ranking 8th** among Italian manufacturing

[1] In this Report, the reconstruction of the plastics value chain exploits the Aida Bureau Van Dijk database. Therefore, there may be discrepancies with the values reported by the sector associations, due to the different perimeter of companies taken into consideration.

sectors. The plastics industry therefore has a value equal to the sum of the **paper** manufacturing sector (equal to 24.2 billion Euros) and the **textile industry** (equal to 20.6 billion Euros). In particular, Italy is the **2nd country in EU27+UK** in terms of turnover in this industry, only behind Germany, which is worth 31.9% of the EU27+UK total (against Italy's 14.2%), a value approximately 2.2 times higher.

In terms of **Value Added**, the plastics industry also has a virtuous positioning within the Italian manufacturing system, generating **12.7 billion Euros** (**5.1%** of the country's total manufacturing) and **ranking 5th**, a value slightly lower than the automotive industry and higher than the electronics industry. Therefore, compared to what was observed for turnover, the plastics industry gains 3 positions, showing greater profitability than the other sectors.

In terms of **exports,** the plastics sector also ranks highly, with a value – in 2020 – of **19.9 billion Euros** (**4.8%** of the Italian total manufacturing). Among manufacturing sectors, it thus ranks **9th**, ahead of the electronics sector.

With reference to the **socio-occupational** dimension, the plastics industry is also of extreme relevance for the country's manufacturing system. In 2020, the plastics industry supported around **180,000 employees**, a value higher than the number of people employed in the Italian automotive, textile and beverage industries. In particular, the plastics industry accounts for **4.7%** of employment in total Italian manufacturing.

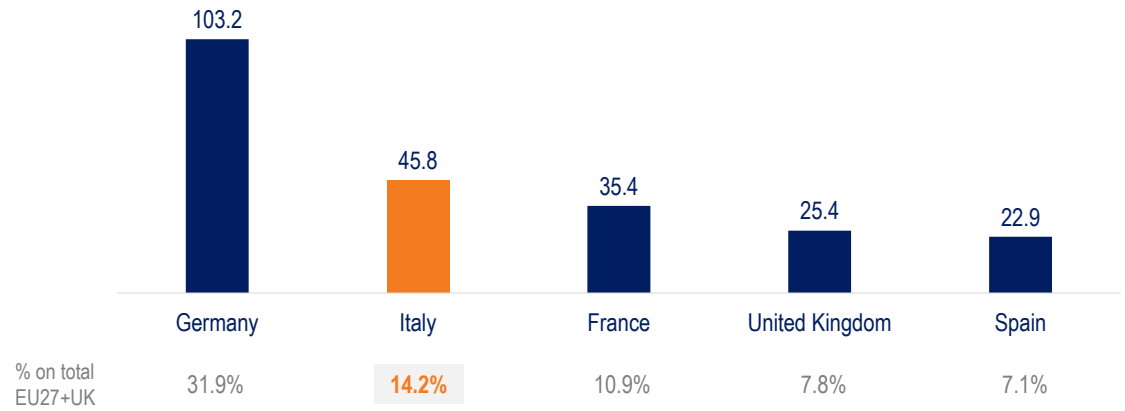

Figure II. Turnover of the plastics industry in the European Big-5 countries (billion Euros), 2020. *Source: The European House - Ambrosetti elaboration on Aida Bureau van Dijk and Eurostat data, 2022.*

2. Between 2016 and 2019, the Italian plastics industry reported double-digit growth rates in turnover and Value Added, proving to be more resilient than the Italian manufacturing average in 2020.

An analysis of the turnover and Value Added dynamics of the plastics industry over the last five years shows a virtuous positioning of the sector, both before and after COVID-19. Indeed, from 2016 to 2019, turnover and Value Added both increased, by **15.2%** and **17.4%** respectively. In 2020, moreover, following the COVID-19 pandemic, the sector showed **greater resilience** than the manufacturing average, losing 'only' **7.3%** in terms of turnover compared to 2019 (versus 12.4% at the overall manufacturing level) and 0.8% in terms of Value Added (versus 12.0% at the overall manufacturing level).

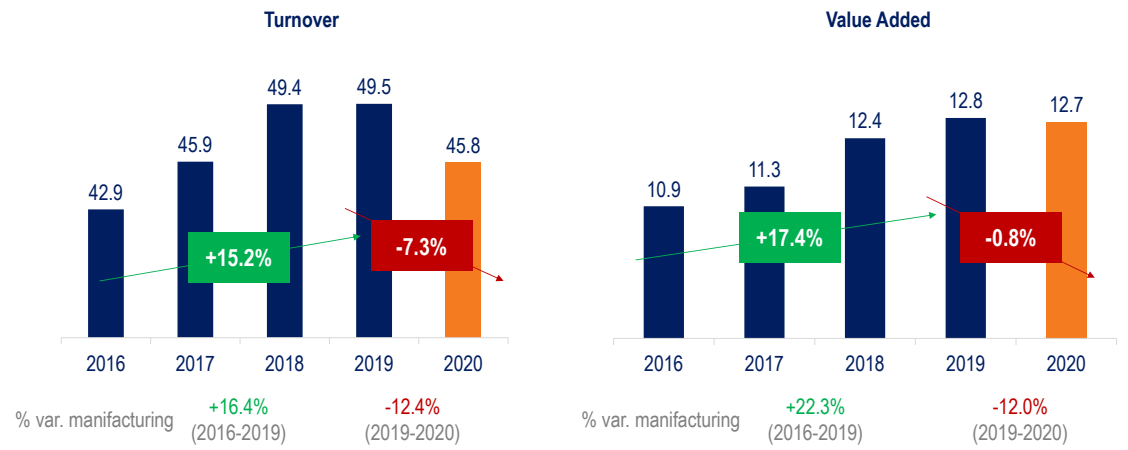

Figure III. Turnover and Value Added of the plastics industry in Italy (billion Euros), 2016-2020. *Source: elaboration The European House - Ambrosetti on Aida Bureau van Dijk data, 2022.*

Shifting the trend analysis at the European level, Italy ranks **1st** among the European Big-5 countries in terms of turnover growth rate from 2016 to 2019, **+15.6%**, **5.1 percentage points** higher than Spain (10.1%), which ranks 2nd. In addition, the Italian plastics sector has also proven to be highly resilient in the wake of the COVID-19 pandemic: only the French plastics industry reports (in 2020 compared to 2019) a lower drop in turnover (-3.6 percentage points) than Italy (-8.5 percentage points).

3. The Italian plastics industry has some distinctive characteristics. On the one hand, within the value chain, the transformation phase generates about 75% of the turnover, but it is the recycling phase that has the highest growth rates in all the considered indicators (turnover and Value Added). On the other hand, the bioplastics industry generated in 2021 about 1.1 billion Euros in revenues (2% of the industry as a whole), employing about 2,900 workers in about 275 companies[2], and qualifying itself as a European excellence.

The Italian plastics industry has some **distinctive features** compared to the European context: ***i)*** the weight of the phases that make up the chain itself; ***ii)*** the bioplastics component.

The analysis of the different phases that make up the plastics value chain, in comparison with the European average, highlights the relevance of the **transformation** phase, which in Italy generates the highest share of turnover, **74.8%** of the total, a value **7.5 percentage points** higher than the European average. The different distribution of turnover in Italy compared to the European average highlights, however, the gap in the **production** phase, which in Italy represents **15.3%** of the total turnover against 27.1% at European level. At the same time, also the machinery (7.8% in Italy against 4.7% at

[2] Source: Plastic Consult for Assobioplastiche, "*La filiera dei polimeri compostabili – dati 2021 e prospettive*", 2022.

European level) and recovery (2.1% against 0.9% at European level) phases are more virtuous than what reported at European level.

Despite a weight in total turnover that places it at the last place among the four phases, over the last five years, it is the **recycling** phase that shows the greatest increase in terms of turnover, with a growth of **+40%**, more than 30 percentage points higher than the growth recorded by production (2nd with a value of +8.7%). Even more pronounced is the increase in the recovery phase in terms of Value Added, amounting to **+72.2%** in 2020 compared to 2016 and **+80.1%** in 2019 compared to 2016.

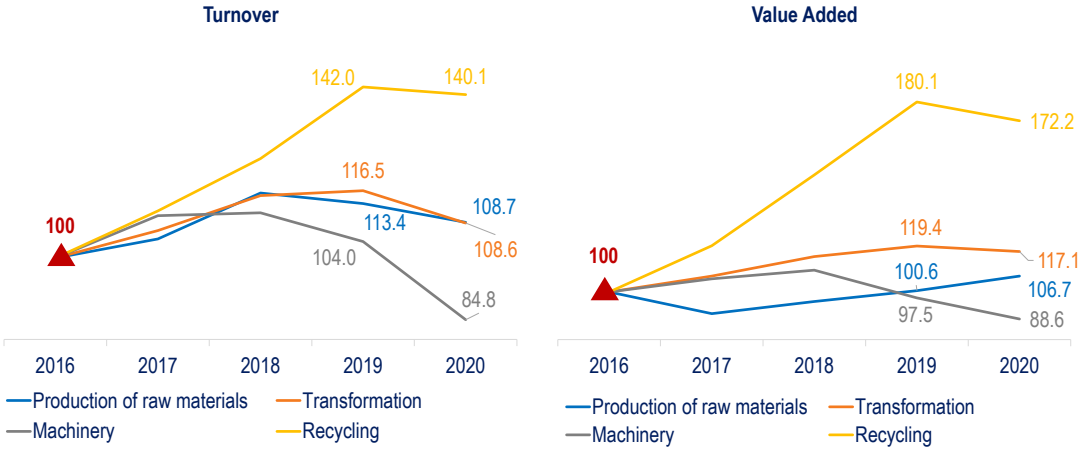

Figure IV. Trend in Turnover and Value Added of companies by plastics value chain phase (2016=100), 2016-2020. *Source: The European House - Ambrosetti elaboration on Aida Bureau van Dijk data, 2022.*

A further distinguishing feature of the Italian plastics value chain, in a context of innovation that does not see Italy in a particularly virtuous position in comparison with Germany and France, is determined by the **bioplastics** industry, which is becoming increasingly relevant in the Italian value chain. According to the reference study elaborated by Plastic Consult for Assobioplastiche, as of 2021, the Italian bioplastics component of the value chain supported **about 1.1 billion Euros in revenues**, equal to approximately **2%** of the total industry aforementioned. Also, with reference to the number of employees and companies, the bioplastics industry proves to be particularly relevant: it consists of about **275 companies** and employs about **2,900 people**[3].

[3] Source: Plastic Consult for Assobioplastiche, "*La filiera dei polimeri compostabili – dati 2021 e prospettive*", 2022.

4. For every 100 Euros invested in the plastics sector, 218 Euros are generated in the extended value chain and for every 100 direct jobs, 177 additional jobs are generated in the related value chain. The plastics sector is also the manufacturing sector that has the greatest distribution of direct economic impact on other sectors (1st sector out of the 17 manufacturing sectors analysed).

To support the economic and occupational relevance of the plastics industry in Italy, The European House - Ambrosetti calculated the **economic** and **occupational multipliers** of the plastics industry.

Starting from the input-output matrices provided by Istat at national level for 63 economic sectors, the results show that for every 100 Euros invested in the plastics sector, 218 are generated in the extended value chain (193 for indirect impact and 25 for induced impact). The economic multiplier is therefore **3.18**, an increase of **33%** compared to the previous analysis in 2013[4], thus showing an increase in the interdependencies of the plastics value chain with the economic fabric of the country.

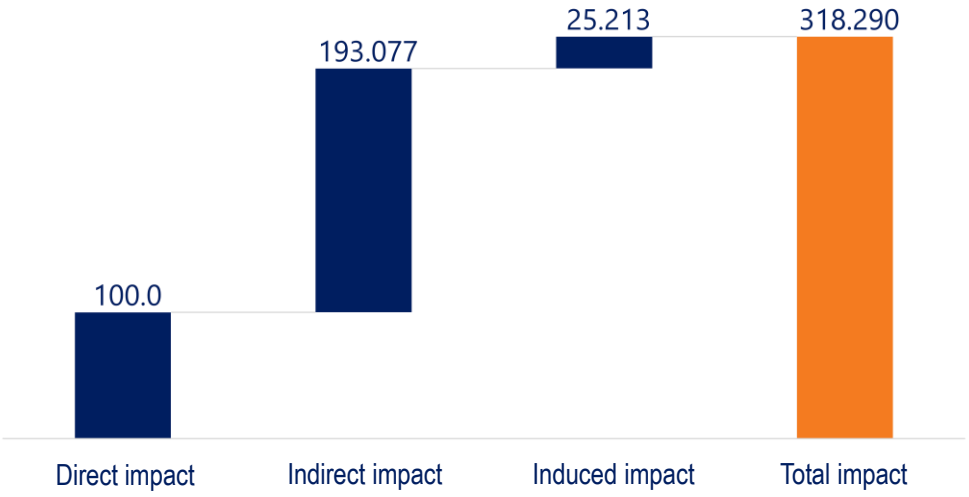

Figure V. Direct, indirect and induced impact generated by additional investment in the plastics sector (Euros). *Source: The European House - Ambrosetti elaboration on Istat data, 2022.*

Linked directly to the economic multiplier is the **occupational** multiplier. It is **2.77**, still increasing, even if slightly (by **1.1%**), compared to the 2013 analysis. For every 100 direct jobs in the plastics sector, 177 jobs are activated in the related value chain (143 for indirect impact and 34 for induced impact).

Finally, moving from the economic multipliers described and analysed above, The European House - Ambrosetti has analysed three indicators to understand the **degree of relevance of individual sectors in terms of interconnection and diffusion**

[4] The European House - Ambrosetti, "*L'eccellenza della filiera della plastica per il rilancio industriale dell'Italia e dell'Europa*", 2013.

of benefits in the Italian economy. Based on the Gini concentration index model[5] , the following indicators were developed[6]:

- the **manufacturing input concentration index**: it calculates how many value chains or sectors it activates to generate its output. The plastics sector has a value of 0.67 (against a manufacturing average of 0.79) and is **3th** among the 17 mapped manufacturing sectors. This indicates that the sector purchases inputs from more value chains, activating more of them than the other manufacturing sectors;
- the **concentration index of final production**: it calculates how many value chains or sectors the sector's production is aimed at. In this case, the plastics value chain ranks **8th** (0.72) and is in line with the average for manufacturing in terms of the diversification of its sales in the country's economy;
- the **concentration index of the direct economic multiplier**: analyses the diversification of direct economic benefit in the Italian economy. The plastics sector ranks **1st** among the 17 manufacturing sectors (0.53 compared to 0.58 for manufacturing), as it diversifies the most direct economic benefit in the Italian economy.

5. The European legislation is supporting the development of a Circular Economy paradigm that also concerns the plastics sector and involves the valorisation of waste as a productive input.

In recent years, the European Union has progressively increased its commitment towards the ecological transition and the shift to the Circular Economy paradigm. In March 2020, the European Commission adopted a new **Circular Economy Action Plan** with targets covering both waste management categories, such as municipal waste recycling and landfilling, and individual materials. Specifically, the new Circular Economy Action Plan sets targets for:

- **70% of packaging waste recycled**, with different targets for individual materials (30% wood, 55% plastic, 60% aluminium, 75% glass, 80% ferrous materials, 85% paper), by 2030;
- **65% recycling of municipal waste** by 2035;
- **less than 10% of waste going to landfill,** with a ban on recyclable waste, by 2035.

In addition to legislation concerning the ecological transition and the Circular Economy as a whole, the European Union has also approved *ad hoc* strategies and directives for the plastics sector over the years. In particular, the four most relevant acts are:

- **European Strategy for Plastics in the Circular Economy**, adopted in January 2018;

[5] The Gini concentration index, also called the Gini coefficient, is an indicator measuring the degree of inequality in income distribution. It is also used in economics and politics to study other socio-economic phenomena, such as the distribution of wealth.

[6] The indicators take a value between 0 (minimally concentrated) and 1 (maximally concentrated).

- **Directive 2018/851/EU** setting minimum recycling targets for municipal waste to 2025, 2030 and 2035, adopted in May 2018;
- **Directive 2018/852/EU** setting minimum recycling targets for packaging waste to 2025 and 2030, adopted in May 2018;
- **Directive 2019/904/EU** imposing bans or restrictions on the use of Single-Use Plastics (so-called SUP Directive), adopted in June 2019.

Firstly, the **European Strategy for Plastics in the Circular Economy** defines a high-level strategic vision for the sector, placing it in the broader context of the Circular Economy. In particular, the strategy sets three general objectives to be reached by 2030:

- at least **50% of plastic waste** will have to be recycled;
- **100% of packaging** must be reusable or recyclable;
- the **sorting and recycling capacity** of plastic waste will have to be **quadrupled** compared to 2015.

The recycling targets set by **Directive 2018/852/EU** for plastic packaging are **50%** by 2025 and **55%** by 2030. However, as of 2019 (the latest available year that allows a comparison between the 27 EU countries), Italy reports a value of **44.7%**, 5.3 percentage points lower than the 2025 target and 10.3 percentage points lower than the 2030 target.

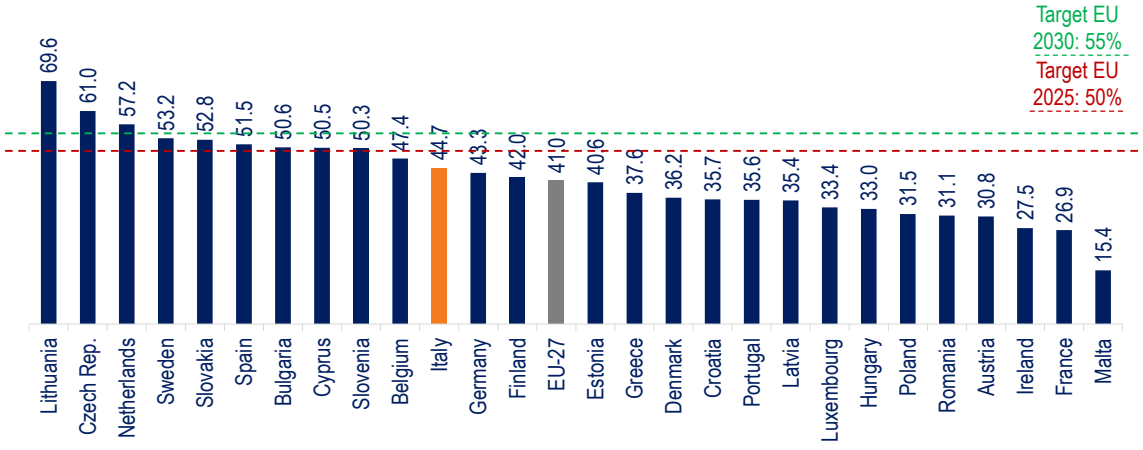

Figure VI. Recycling rate of plastic packaging in the EU-27 countries (percentage values), 2019. *Source: The European House - Ambrosetti elaboration on Eurostat data, 2022.*

With reference to all the other materials included in the Directive (paper and cardboard, glass, ferrous materials, aluminium and wood), **Italy has already reached the recycling targets for 2025**: in fact, plastics is the only material for which the country has not yet reached the European targets set by the Directive. Moreover, Italy has already reached the 2025 target also concerning the recycling of compostable bioplastics: in 2021, the recycle rate is equal to 51.9%, 1.9 percentage points higher than the target established for 2025 (50%)[7].

[7] Source: Biorepack, "*Relazione sulla gestione attività 2021*", 2022.

For what concerns the **Directive 2018/851/EU** instead, it introduced targets for the **recycling of municipal waste** as a whole (without, therefore, distinguishing on the basis of specific product fractions). These targets are **55%** by 2025, **60%** by 2030 and **65%** by 2035.

Finally, the **Directive 2019/904/EU**, which imposes bans or restrictions on the use of single-use-plastics (so-called SUP Directive) of June 2019, aims to reduce – up to and including the total elimination – of the use of **single-use plastics**, thus favouring the use of recyclable plastic products and the spread of recycled plastics.

6. To fully exploit the potential of the circularity of plastics, The European House - Ambrosetti has adopted an original approach of analysis, which extends the treatment of plastic waste to the integrated management of input, product/process and output phases.

In order to identify the tools and technological solutions that can (or have already) significantly impact the plastic value chain in order to increase its circularity, The European House - Ambrosetti has extended the analysis approach to the three sequential phases of the life of the plastics resource: ***i)*** **sustainable input** (the research for **new solutions** to make plastic circular at the base, i.e., starting from the materials used in the production phases); ***ii)*** **product and process** (refers to innovations concerning the final product and the related production phase); ***iii)*** **end-of-use and new life** (refers to the treatment that the product or waste material undergoes at the end of its use).

From a methodological point of view, an integrated conceptual framework was identified as necessary for the effective assessment of the circularity of plastics. For this reason, the framework includes the three phases described above of sustainable input, product-process, end-of-use and new life, in addition to the identification of the best existing and emerging **technologies or techniques**, including their improving role in terms of circularity.

Furthermore, a distinction was made between **'traditional' plastics**, i.e., plastics produced through the use of fossil materials, and bioplastics, i.e., **bio-based and vegetal-based plastics**. In particular, an in-depth analysis was devoted to the contribution that bio-based and vegetal-based plastics can make to circularity.

Finally, the benefits that **new input materials** and **new production and disposal techniques/technologies** can bring in favour of circularity were quantified, keeping a distinction between improving effects for all types of plastics, both for different fossil-derived plastics and for bioplastics. In particular, in order to identify the benefits, patents (about **300** patents filed by the EPO – European Patent Office), academic-managerial literature sources (about **1,500** academic-managerial papers related to plastic innovations) and international reference applications (about **150** applications and examples related to the three life phases of plastics) were analysed.

7. For each plastic life stage, The European House - Ambrosetti identified the main areas of technological innovation and their impacts in terms of circularity.

Within the **sustainable inputs phase**, the technological analysis aimed to identify new solutions to make plastic circular from the materials used in the production stages:

- new material input technologies make it possible to reduce the use of fossil materials in the creation of the raw materials needed to produce plastic by about **25%**;
- efficient input creation processes can achieve a reduction of about **27%** in the energy consumption required to complete the process, while new materials and processes can reduce energy consumption by **15%** due to easier processing;
- reductions of **22.5 %** in CO_2 emissions into the atmosphere can be achieved through the development of new technologies;
- through the use of **innovative inputs** and additives, the service life of products can be increased by **20%**, positively influencing the circularity of plastics.

As far as the **product-process phase** is concerned, the analysis identified new production techniques aimed primarily at **optimising production cycles**, in particular by reducing the input materials required and processing waste, so as to be able to reduce the volumes of materials used and the resulting impacts, for example by exploiting innovative technologies such as 3D printing:

- thanks to additive manufacturing technologies, processing waste can be reduced by **20%**;
- new technologies capable of generating quality output with higher volumes of second-generation material enable production processes that use **15%** of more recycled material;
- through the use of new production processes, it is possible to decrease the use of input material required (**-15%**) and reduce CO_2 emissions by **56%** by 2050;
- the use of renewable energy sources allows a **62%** reduction of CO_2 emissions in the production phase.

Finally, as far as the **end-of-use and new life phase** is concerned, the analysis focused on identifying new technologies aimed at **improving the efficiency of existing and emerging sorting and recycling processes**:

- the adoption of technological tools (such as sensors equipped with Artificial Intelligence) makes it possible to increase the amount of material that enters recycling processes – particularly in mechanical recycling – leading to a **20%** increase in process efficiency;
- the combination of mechanical recycling and chemical recycling techniques will reduce landfill volumes by **50%**;
- new chemical recycling technologies can lead to a **25%** reduction of fossil-based raw material by 2030.

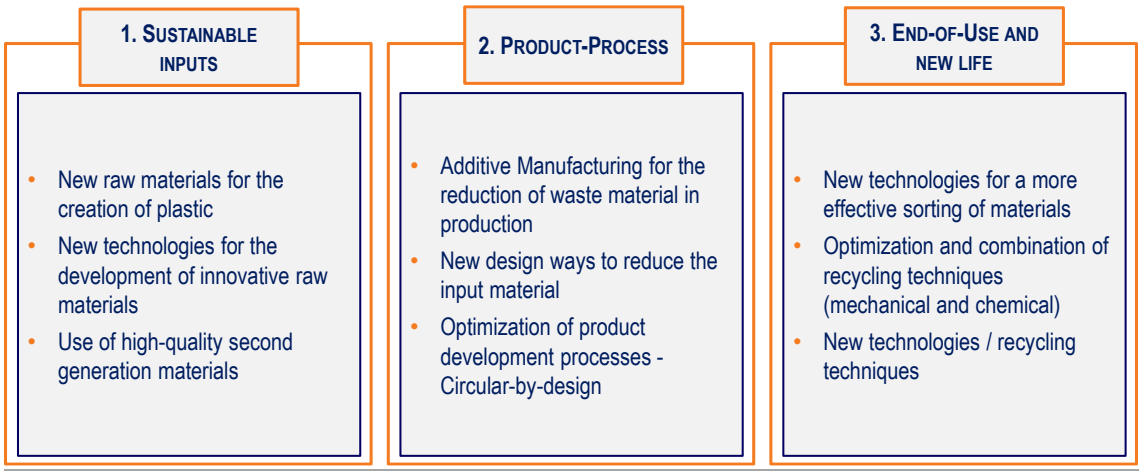

Figure VII. The main descriptive results of the technology analysis at each plastic life stage. *Source: The European House – Ambrosetti elaboration, 2022*

8. Product and process innovations contribute to 85% of the reduction of plastic waste by 2030, while thanks to the complementarity of mechanical and chemical recycling Italy can reach the target of 10% of waste going to landfill by 2030, 5 years ahead of what established by the European legislation.

The European House - Ambrosetti developed **two "what-if" scenarios** to measure the economic and occupational impacts of increasing circularity in the plastics industry in the time horizon from now until 2030.

The **starting point** of the analysis is the **amount of plastic waste in 2020**, equal to **4,948 thousand tonnes**, according to the latest data reconstructed by The European House - Ambrosetti in collaboration with ISPRA. Then, on the basis of the CAGR (Compound Annual Growth Rate) for the period 2016-2020, the quantity of plastic waste to 2030 was estimated at 6,305 thousand tonnes (**+27.4%** compared to 2020). **Corrective measures** were applied to this value (banning of single-use-plastics, eco-design, waste reduction, etc.), which are estimated to reduce – also through a **lower production of plastic** – the amount of plastic waste by **1,432 thousand tonnes**, for a final value – in 2030 – of 4,872 thousand tonnes of plastics waste (**-22.7% compared to the trend scenario to 2030**). This reduction is due for **85%** to **product and process innovations** resulting from investments planned by plastics chain operators, and the remaining 15% by regulatory pressure (e.g., the ban on single-use-plastics).

Starting from these values, The European House - Ambrosetti estimated the potential – up to 2030 – of **mechanical and chemical recycling** for a greater circular valorisation of the plastics value chain. In particular, the following assumptions were defined for the two "what-if" scenarios:

- for **mechanical recycling**, a **17%** efficiency improvement in the recycling process was estimated due to the deployment of sorting technologies aimed at increasing the quality and output volumes of mechanical recycling;
- for **chemical recycling**, on the basis of the technological analysis and the mix of plastics produced in Italy, it has been estimated that – in the Scenario 1 based on the

implementation of **pyrolysis** plants[8] – an amount of plastic waste treated of 307 thousand tonnes (equal to **6.3%** of the total plastic waste by 2030) could be reached. In the Scenario 2, thanks to the deployment of other technologies that the mapping shows to be less mature, such as depolymerisation and gasification, the amount of chemically treated plastics waste could reach up to 551 thousand tonnes, or **11.3%** of the total estimated plastic waste by 2030[9];

- for **energy recovery**, in view of the existing treatment capacity and the primary objective of reducing waste to landfill, it was assumed that the amount of plastic waste sent to energy recovery would **remain constant** until 2030;
- for **landfill**, the share of plastics waste going to landfill in 2030 is the **residual share** compared to the other types of treatment.

In **Scenario 1**, the amount of **plastic recycled increases by 14.3 percentage points** compared to 2020 due to the increase in the capacity of mechanical recycling (equal to +17%) and the penetration capacity of chemical recycling, in this first scenario equal to **6.3%**. Overall, the amount of plastic recycled rises to **2,757 thousand tonnes** or **56.6%** of the total plastic waste.

In **Scenario 2**, this percentage increases to **61.6%**, due to a higher penetration of chemical recycling (at the same capacity as mechanical recycling), which increases by 5 percentage points thanks to technologies such as depolymerisation and gasification and is estimated to recycle **11.3%** of the total estimated plastic waste in 2030. The increased penetration capacity of chemical recycling has been assumed to reduce the amount of plastic waste sent to landfill by a corresponding amount, which in this scenario represents 3.2% of the total. Therefore, in both scenarios, **Italy reaches already in 2030 the EU target of sending to landfill less than 10% of waste by 2035**.

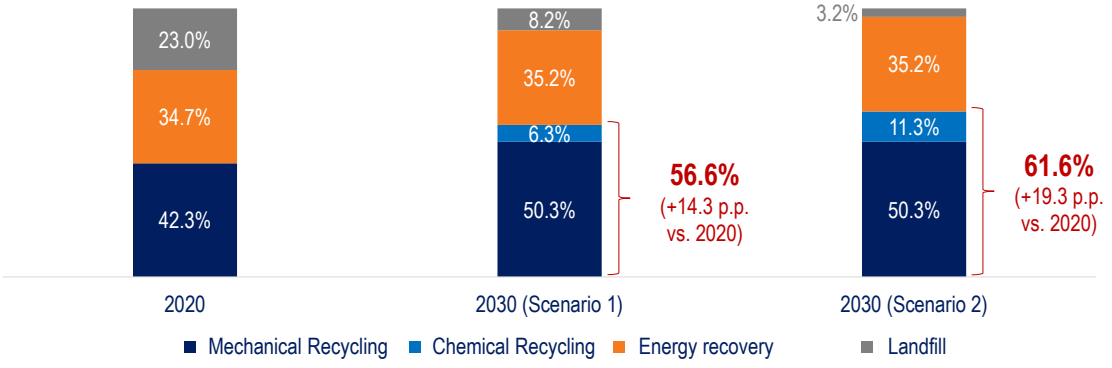

Figure VIII. Share of plastics waste by type of treatment (thousands of tonnes and percentage values), 2020 and 2030 (Scenario 1 and 2). *Source: The European House - Ambrosetti elaboration on ISPRA data, 2022.*

[8] Pyrolysis is estimated to recycle between 50% and 65% of the treated material.

[9] According to the guidelines released by the European Commission on April 6th, 2022 «*Guidance for the compilation and reporting of data on packaging and packaging waste according to Decision 2005/270/EC*» the chemical recycling refers only to material recovery and not fuel recovery (considered as energy recovery).

9. The benefits for Italy of deploying the necessary investments to support the increased circularity of plastics amount to between 1.5 and 2.5 billion Euros depending on the Scenario considered.

The calculation of the benefits for Italy stems from the **investments** needed to enable the growth of circularity as identified in the 2 scenarios. The analysis shows that investments between **477 and 794 million Euros** are needed to build the necessary chemical and mechanical recycling plants, based on a lower (Scenario 1) or higher (Scenario 2) penetration of chemical recycling.

Following the identification of the investments related to the 2 scenarios, the **economic benefits** deriving from these investments for Italy were quantified. In detail, to calculate these benefits, the **economic multiplier** associated with the plastics industry, equal to **3.18,** was applied to the amount identified. The systemic benefits can, therefore, amount to between **1.5 and 2.5 billion of Euros**, depending on the Scenario considered. Obviously, the highest benefit in Scenario 2 is linked to the higher amount of plastics recycled due to higher penetration of chemical recycling, which therefore requires more investment "upfront" to achieve.

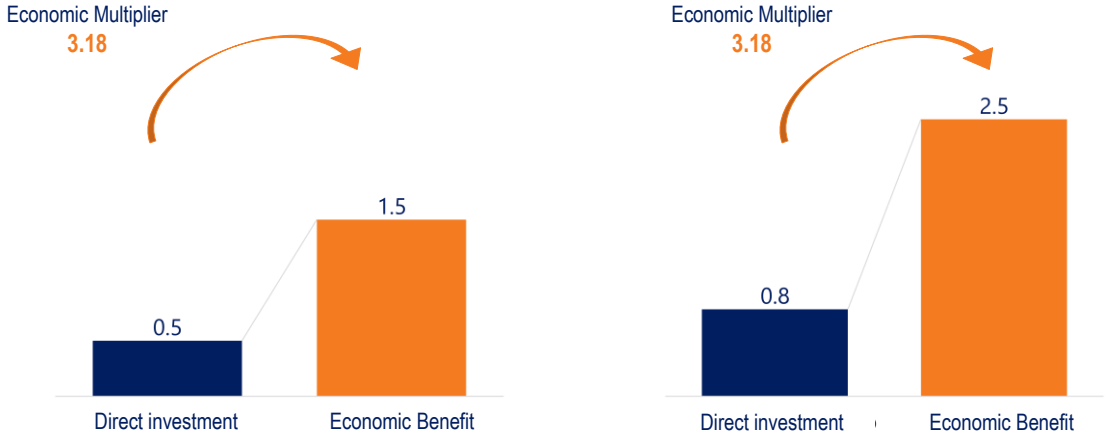

Figure IX. Economic benefits for Italy from the investments needed in Scenario 1 (values in billion Euros, left) and Scenario 2 (values in billion of Euros, right), 2030. *Source: The European House – Ambrosetti elaboration, 2022.*

With respect to the **occupational benefits** for the country deriving from the investments quantified in the 2 scenarios, the **occupational multiplier** of the plastics industry, equal to **2.77**, was applied to the 1,015 additional jobs estimated to be created in Scenario 1 and the 1,387 additional jobs estimated to be created in Scenario 2. The increased circularity of plastics as identified in the 2 scenarios, therefore, could enable employment benefits for Italy of **2,811 additional jobs in Scenario 1** and **3,842 additional jobs in Scenario 2**. The values in question only represent the benefits associated with the construction of the new plants and do not consider the benefits of the strengthening of a real plastics recycling value chain.

10. The European House - Ambrosetti identified 7 lines of action to enhance circularity in the Italian plastics industry.

The greater circularity of plastics, with the related investments and economic-employment benefits, requires, as of now, the mobilisation of the entire plastics industry in specific lines of action that favour the technological-productive processes underway. In particular, The European House - Ambrosetti has identified, in the course of the work that led to the drafting of this Report, **6 punctual proposals for action** that add up to **1 further systemic indication** that envisages the adoption of an integrated value chain approach that is functional in enhancing the plastics industrial sector, which is a primary competitive factor for the country:

1. increase **separate collection** as an **essential prerequisite** for ensuring the circularity of the plastics value chain;
2. **speed up environmental authorisation procedures** and reduce the '**NIMBY syndrome**' to reduce the waste service divide;
3. support the **growth of the Italian bioplastics industry** and encourage the **increase of organic recycling for biodegradable plastics**;
4. encourage greater **synergy between public and private actors** to promote virtuous **innovation processes in the plastics sector**;
5. review the current **Extended Producer Responsibility (EPR) mechanisms** with the aim of simplifying processes and **making the plastics value chain more circular**;
6. facilitate the creation of an **outlet market** for **"End of Waste" materials**;
7. adopting an **integrated value chain approach** to increase the **sharing of regulatory choices**.

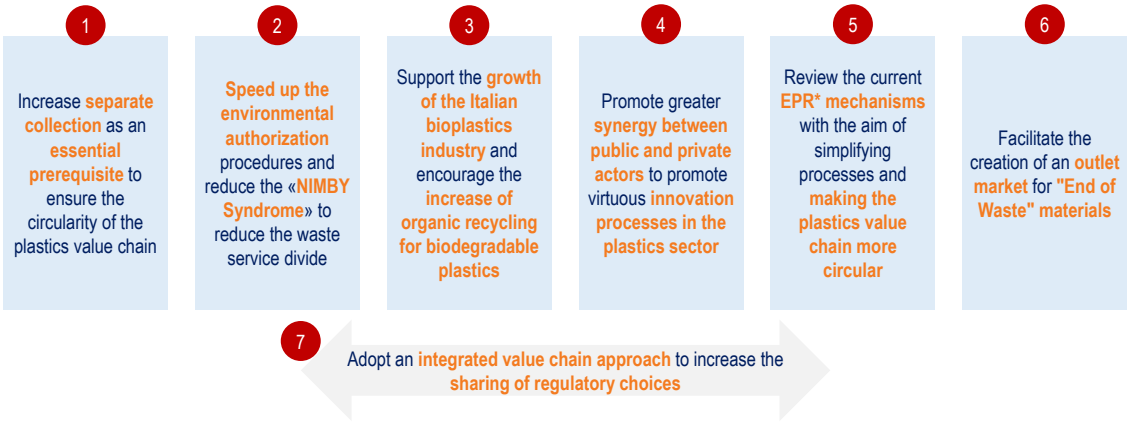

Figure X. The lines of action identified to enhance circularity in the Italian plastics value chain. *Source: The European House – Ambrosetti elaboration, 2022.* (*) EPR: Extended Producer Responibility.