

HOW TO BOOST PLASTICS RECYCLING AND INCREASE RESOURCE EFFICIENCY?

STRATEGY PAPER OF
PLASTICS RECYCLERS
EUROPE



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1 FORWARD



Europe is leading the market in terms of sustainable development thanks to European legislation aiming to protect the environment. The European Lisbon Treaty goes even further than previous treaties on the environment. The new treaty states that the European Union should aim for an 'improvement of the quality of the environment' and should not only protect it. According to the Flagship initiative under the Europe 2020 Strategy, issued by the European Commission, one of its objective, is A Resource Efficient Europe. In accordance with this goal, our society should put more importance to manage our resources better. Hence, the recycling industry being 'the guardians' of waste reprocessing and waste management, should gain more attention and visibility in order to be provided with conditions which will enable it to grow and develop, as well as to secure supply of essential resources for Europe. The recycling of post-consumer plastics waste is a challenging and multi-facial topic, for which real solutions exist such as mechanical recycling. This paper offers an analysis of the plastics industry profile, paying special attention to plastics recycling. Secondly, it provides an overview of the current post-consumer plastics recovery operation, underlining the benefits of mechanical recycling. Finally, with this paper, EuPR gives a recommendation of 3 fundamental actions to increase the recycling of post-consumer plastics waste in Europe:

- [1. BAN PLASTICS WASTE FROM LANDFILL](#)
- [2. HIGHER PLASTICS RECYCLING TARGETS](#)
- [3. ECO-DESIGN FOR PLASTICS PRODUCTS](#)

EuPR is willing to cooperate with all market stakeholders and policy makers in order to achieve better post-consumer plastics recycling opportunities to move towards a 'real recycling society' and 'resource efficient society'. With our new branding "**Plastics Recyclers Europe**" we aim at demonstrating that an important sector in the plastics industry is growing with its own identity and that this sector can stimulate positive growth in Europe in terms of jobs and welfare.

A handwritten signature in blue ink, appearing to be 'Tons Emans', written over a light blue grid background.

Tons Emans
EuPR. President

2 INTRODUCTION

2.1 PLASTICS RECYCLERS EUROPE ASSOCIATION

EuPR¹ comprises of plastics mechanical recycling companies with treatment facilities in Europe. It was set up in December 1996 and it represents approximately 80% of the estimated European plastics mechanical recycling capacity. EuPR's mission is to create a good business climate for mechanical plastics recyclers by:

- Representing the plastics recycling industry vis-à-vis the European institutions industry organisations and users.
- Promoting the use of quality plastics recyclates; innovative products.
- Promoting the development and use of harmonised European standards for plastics recyclates (Eu CertPlast)
- Initiating and stimulating European studies for the plastics recycling industry; and
- Offering a networking platform for its members, e.g. companies through its working groups (PET, PVC, PP and HDPE, mixed plastics,...).

2.2 INDUSTRY PROFILE

The plastic industry is an important sector of the European economy. Plastic products are omnipresent in everyday life of the consumers, providing them with numerous advantages and benefits. They are an extensively used material in a number of sectors and industries. Due to its distinctive properties as well as continuously growing innovation applications, the trend in production for plastics will continue to increase. Year 2010 has seen a continuous recovery for the European plastics industry on a prominent increase in turnover for the converting industry, since the 2008 crisis. However EU polymer production is suffering with old infrastructures and many high maintenance costs and thus many Forces Majeures. The European plastics mechanical recycling industry is a rather new industry, consisting of more than 1,000 companies – mainly small or medium-sized – and employing around 30,000 people. Originally, plastics recycling grew alongside the plastics industry, with companies initially concentrating on the reprocessing of production and processing of scraps. But over the years, the recycling of post-consumer plastics gradually took off, with important growth being recorded in the last decade. This industry, therefore, plays a significant and essential role in today's move towards a sustainable society^{2/3}.

¹ <http://www.plasticsrecyclers.eu>

² The Packaging and Packaging Waste Directive 2008/98/EC

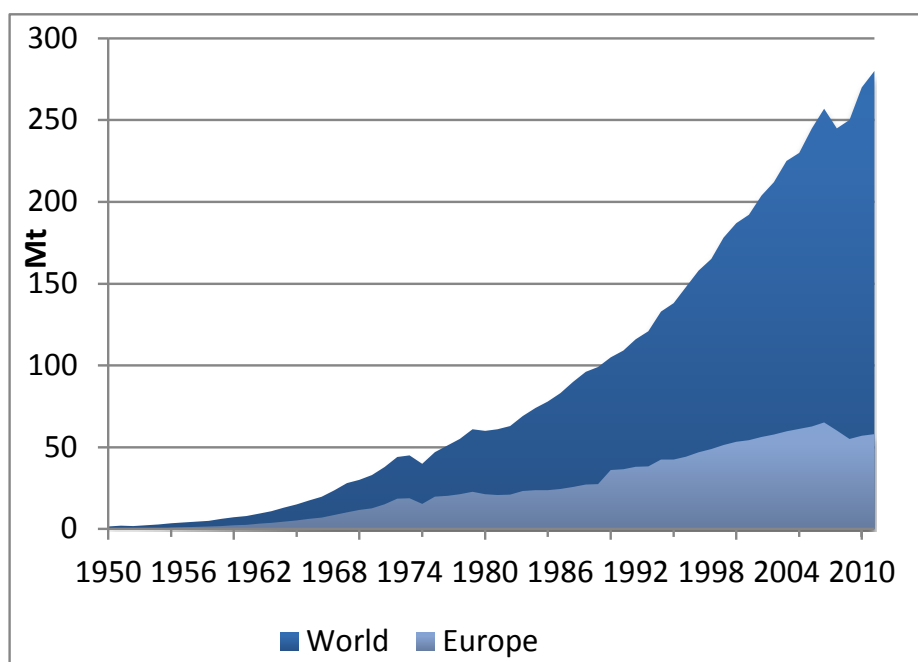
³ The Waste Framework Directive

2.3 THE PLASTICS INDUSTRY IN EUROPE

2.3.1 THE VIRGIN PLASTICS MARKET

According to *Plastics the Facts 2012*¹, the total global production of plastics grew from around 1.5 million tonnes in 1950 to 280 million tonnes in 2012.

2-1 WORL PLASTICS PRODUCTION 1950-2012



Source: *Plastics the Facts 2012*

Despite an increase (2.4%) in post-consumer plastics waste production in 2011, there was a drop in landfilling of waste observed.

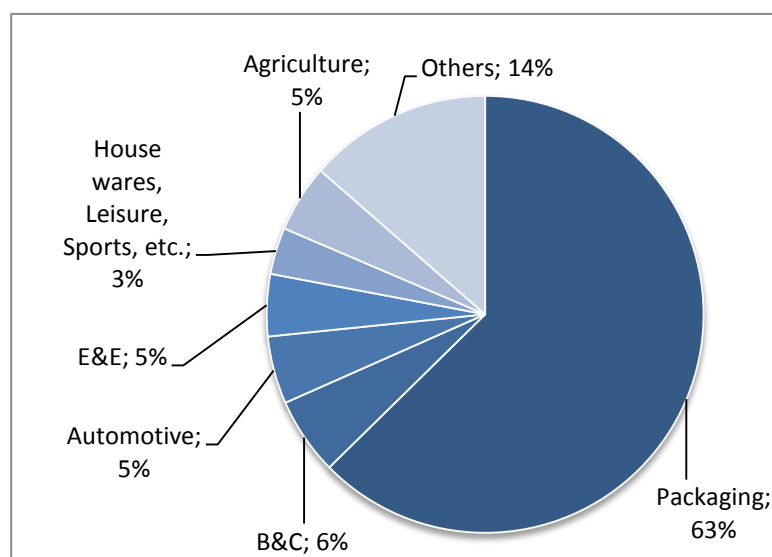
There are five high-volume plastics families: polyethylene (including low density (LDPE), linear low density (LLDPE) and high density (HDPE)), polypropylene (PP), polyvinylchloride (PVC), polystyrene (solid PS and expandable EPS) and polyethylene terephthalate (PET). Together, the Big Five account for around 75% of all plastics demand in Europe. The packaging industry remains the biggest plastics end-user at 39.4%, followed by the Building and Construction sector at 20.5%. The Automotive and Electrical & Electronic industries use 8.3% and 5.4%, respectively. Finally, medical, leisure and other applications use together 26.4%.

¹ *Plastics - The Facts 2012* - An analysis of European plastics production, demand and waste data for 2011, a study carried out by EuPR, EuPC, PlasticsEurope and EPRO. For more information: www.plasticsrecyclers.eu

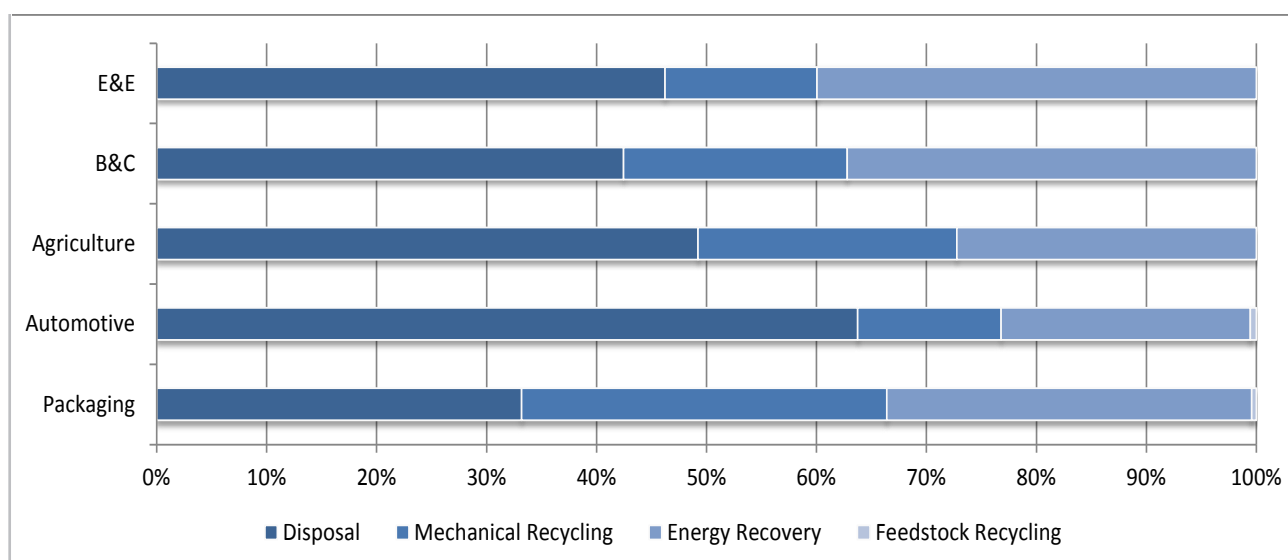
2.3.2 THE PLASTICS WASTE MARKET IN EUROPE

Post-consumer plastic waste collected in 2011 reached 25.1 millions tonnes. This means an increase of 2.4% in comparison to 2010. There was an increase in recovery activities. The recovery rate rose by almost 4.8%, whereas mechanical recycling increased by 5.7% and energy recovery by 4.2%. There was a 1% decrease in disposal quantities. That means the situation got more stable in comparison to the one from 2010. The total share of different applications stay as well on rather the same level in comparison to 2010, with packaging still having the biggest contribution.

2-2 GENERATION OF POST-CONSUMER PLASTICS WASTE BY APPLICATION (2011)



2-3 COLLECTION FOR RECYCLING AND ENERGY RECOVERY RATES PER COUNTRY (2011)



Source: Plastics - The Facts 2012 - An analysis of European plastics production, demand and waste data for 2011, a study carried out by EuPR, EuPC, PlasticsEurope and EPPO. For more information see: www.plasticsrecyclers.eu

3 PLASTICS WASTE MANAGEMENT: OVERVIEW OF RECOVERY OPERATIONS

Plastics Recycling has become a 'hot topic' nowadays. This is particularly the case since the revised EU Waste Framework Directive has set a minimum recycling target of 50% for household waste and 70% for building and construction waste, which must be reached by all EU Member States, by 2020 for each of the different materials, including plastics. To better protect the environment, the European Union requests that Member States take measures for the treatment of their waste, which must be in line with the following hierarchy, listed in order of priority. Member States are currently implementing several legislative measures to reinforce the abovementioned hierarchy, the different levels of which are analysed below, emphasising the critical issues regarding plastics mechanical recycling:

1.Prevention: measures taken before a substance, material or product has become waste;

2.Preparing for reuse: any operation through which products or components that do not constitute a waste are used again for the same purpose for which they were initially created;

3.Recycling: any recovery operation through which waste materials are re processed into products, materials or substances for their original or other purposes;

4.Other recovery, energy recovery: any operation, the principal result of which is waste that serves a useful purpose;

5.Disposal: any operation which does not constitute recovery, even when the operation a secondary result the reclamation of substances or energy.

3.1 PREVENTION

As stated in the Waste Framework Directive, "prevention" means measures taken before a substance, material or product has become waste, that reduce:

- a) the quantity of waste, including through the re-use of products or the extension of the life span of products;
- b) the adverse impacts of the generated waste on the environment and human health; or
- c) the content.

3.2 REUSE

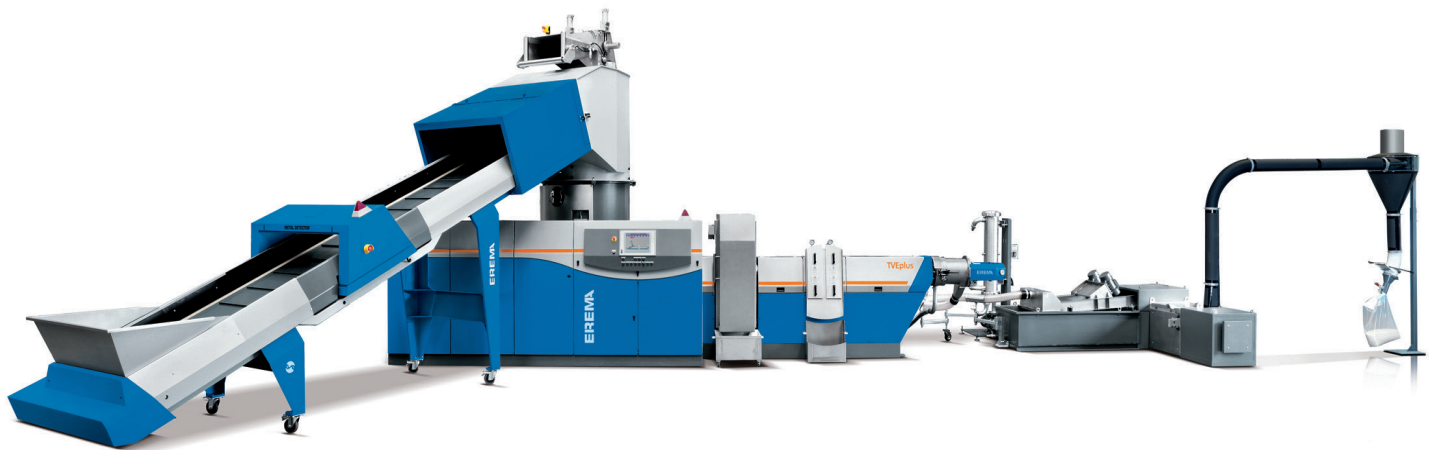
Process of 'reusing' refers to operations through which products, which have been created and designed to accomplish a minimal number of trips or rotations within their lifecycle, are selectively collected and reconditioned, i.e. brought back to a functional state (through washing, cleaning etc.) and used again for the same purpose.

Examples:

- Refillable soft-drink bottles, collected via deposit systems and reconditioned via cleaning;
- Multi-trip plastic crates and pallets; and
- Water jugs.



3.3 RECYCLING



Source: EREMA Engineering Recycling Maschinen und Anlagen Ges.m.b.H

As previously stated, plastics recycling refers to any recovery operation through which waste materials are reprocessed into products, materials or substances for their original or other purposes.

The term 'material recycling' is used in the European Directive 2008/98/EC to distinguish the recycling of various materials (metals, paper, glass, plastics, etc.) from non-recycling operations, such as energy recovery and landfilling. The various available options (recycling via mechanical, chemical and biological routes) have made recycling more complicated for plastics materials. Originally, only direct polymer recovery and reuses via mechanical recycling were covered by the Directive. Before the directive's revision various chemical recycling routes, and even energy recovery, were promoted by some producers organisations in order to be also considered as recycling. This however until today has proven useless and very expensive. When it comes to recycling it is the belief of EuPR that only the chemical recycling processes which aim to recover mainly monomers and chemicals from post-consumer plastics for subsequent use as a feedstock for polymer production (i.e. monomer recovery) should be classified as 'material recovery'. As a consequence, when products of a chemical recycling process are mostly used as an alternative fuel in chemical or power plants, such operations should be considered as energy recovery.

For the abovementioned reasons, EuPR prefers to differentiate between mechanical recycling and energy recovery and, consequently, refrains from using the term material recovery.





Source: Closed Loop Recycling

3.3.1 MECHANICAL RECYCLING

Mechanical recycling refers to operations that aim to recover plastics waste via mechanical processes (grinding, washing, separating, drying, re-granulating and compounding), thus producing plastics recyclates that can be converted into new plastics products, often substituting virgin plastics. For mechanical recycling only thermoplastic materials are of interest, i.e. polymeric materials that may be re-melted and re-processed into products via techniques such as injection moulding or extrusion. Thermosets cannot be reprocessed in this way but may be chemically recycled back to feedstock or used as a carrier (e.g. cement kilns). Thermoplastics represent a variety of multiple polymers with different physical and mechanical properties. A major hurdle for mechanical recycling is that these different polymers are generally non-miscible or compatible with each other. This means that a mixture of different polymers can have inferior mechanical properties which make the recyclates unsuitable for many applications. Consequently, the mechanical recycling of plastics waste is generally only feasible for homogeneous, single polymer streams or for defined mixtures of polymers that can be effectively separated into the individual polymers.

Most mechanical recyclers obtain their input material from collecting and sorting organisations. The market value of recyclates and the costs of the recycling process determine the value of the input material, rather than the actual costs of collecting and sorting which in general should be lower. Since recyclates aim to partly substitute virgin polymers in existing applications, their market value is directly linked to virgin prices. Converters, however, are only willing to pay a lower price than the corresponding virgin resin price because of the assumption that the quality of recyclates is lower than that of virgin materials. It appears that the marketing advantage of using eco-friendly recyclates is not yet strong enough to overcome the abovementioned price gap. A mandatory recycled content can overcome this hurdle. Examples of mechanical recycling of post-consumer plastics waste:

- Collection and grinding of sorted, clean PP crates and blending of the regrind with virgin polymer to mould new crates;
- Collection of PE-LD films used in agriculture and industrial packaging, prewashing, grinding, washing, separating, drying and melt-filtration/re-granulation and processing into refuse bags;
- Collection of PVC pipes, roof-membranes and window-profiles from buildings, grinding, washing, separating, drying and reprocessing into similar or other applications; and
- Collection and sorting of PET bottles used for drinks packaging, grinding, washing, separating, drying and processing into polyester fibres, sheets or containers.





3.3.2 CHEMICAL RECYCLING

Chemical recycling refers to operations that aim to chemically degrade collected plastics waste into its monomers or other basic chemicals. The output may be reused for polymerisation into new plastics, for production of other chemicals or as an alternative fuel. Several technologies have been or are being developed by major chemical companies. In general, investment levels and energy consumption are such that only very large-scale plants are expected to be economically viable. Additionally, another key factor is ensuring the supply of sufficient input materials of the right quality.

3.4 ENERGY RECOVERY

Energy recovery refers to operations that aim to use the released energy obtained during the combustion of plastics waste. This energy can be used to produce heat and/or electricity for domestic or industrial use. This form of recovery should be limited to non-recyclables, in order to, maximise the resource efficiency and increase Europe's sustainability.

3.5 DISPOSAL

Final disposal of waste or residuals from the aforementioned operations, through landfilling or incinerating without energy recovery, is not considered as a recycling or recovery operation and is therefore not included in this paper.

4 HOW TO INCREASE MECHANICAL RECYCLING

4.1 BAN ON LANDFILL

Every year in Europe we dispose of more than 40% of plastics waste. This waste could be in fact destined for recycling. Disposal of waste, does not only have a negative influence upon the environment, but also it affects greatly the amount of waste available for recycling. The practices of landfilling are against resource efficiency and sustainability. The ultimate goal of EuPR, in this matter, is to bring to a halt the dump of plastics waste in Europe, in order to protect the environment reduce marine litter and to make all the produced plastics waste available for recycling. It is vital to propagate environmental awareness and waste management as plastic is a valuable recyclable resource. According to the recent study, in the countries with absolute or shortened landfill the recycling as well as recovery rates are much higher. EuPR is strongly demanding a ban of plastics waste on landfill throughout Europe in order to maximize the amount of waste which is valuable for recycling and to avoid deposit of waste onto land. Tools: In a first step EuPR recommends having progressive equal taxes on landfill based on each national situation. This will help to progressively create the requested infrastructure the efficiency recycle plastics. In a second step, a harmonised EU tax should apply across Europe.



4.2 HIGHER RECYCLING TARGETS

Today only 24% of plastics are collected for recycling in Europe. Plastics possess unique properties such as strength, rigidity, flexibility which are combined with affordability and durability. They are widely applied in a number of sectors and their use is constantly rising (starting with packaging, construction to telecommunications and electronic equipment). As a result, the total share of plastic waste is getting more and more extensive. This means that more emphasis should be put on plastic collection and recycling, in order to achieve environmental sustainability. Plastics waste should be available in sufficient quantities at identifiable sources and in a form that allows selective collection and sorting. That way material suitable for the production of recyclates with low residual levels of contamination and other materials can be collected. The development of low-cost, efficient sorting techniques would enhance the amount and quality of recyclates. Therefore, ensuring the supply of such waste materials is extremely important. Consequently, EuPR calls for: Higher targets for plastics recycling in all the EU legislatures member states. Tools: The future revised waste directives must integrate specific recycling targets for plastics. Furthermore, these targets should move away from a focus on collection to a real objective on recycling in order to stimulate industrial investment in Europe.

Higher % for plastics recycling



4.3 ECO-DESIGN FOR PLASTICS RECYCLING

Design for recycling is a chain responsibility. Assessment of end-of-life aspects, particularly recyclability, should be one of the key criteria in the first stages of a product's conception and design. The design of plastic products needs refinement in order for them to serve longer and for their life cycle to become more valuable as products become more easily recyclable. The organisations behind the new product design (e.g. brand owners) play a crucial role in its conception, as such a product will be eventually destined as an input material for the mechanical recycling industry. For instance, several European plastics organisations have come together to launch the European PET Bottle Platform (EPBP)¹ a voluntary initiative that will offer a service to the packaging industry by assessing new PET bottle formats that enter the European plastics recycling stream. This front-end evaluation process is expected to assist the move towards a more sustainable PET recycling industry in Europe. Vinylplus is another example of value chain towards sustainability of design for recycling. EuPR is in favour of any similar platforms and initiatives whose aim is to boost plastics recycling.

<http://www.petbottleplatform.eu>



5

CONCLUSION

In order for Europe to move closer to a sustainable 'recycling society', the long-term commitment of every actor in the value chain is compulsory. Commitment and responsibility may not even be enough. Experience from the past years has shown that legislation is required to enforce this responsibility. Manufacturers and/or marketers of a product need to be accountable for the impact of that product on the environment. Actions needed to stimulate and increase the mechanical recycling of plastics in Europe include:

1. BAN PLASTICS WASTE FROM LANDFILL

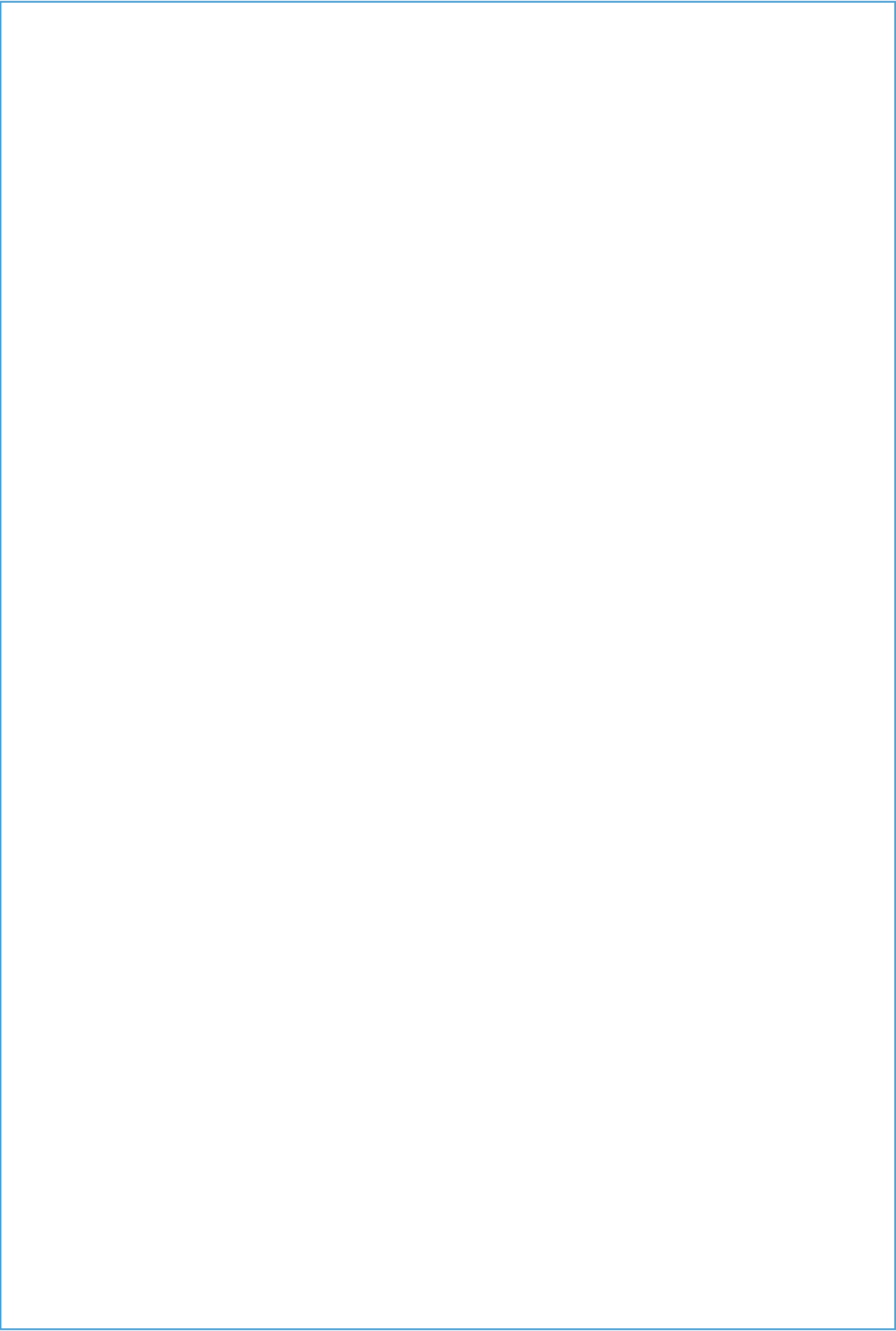
2. HIGHER PLASTICS RECYCLING TARGETS

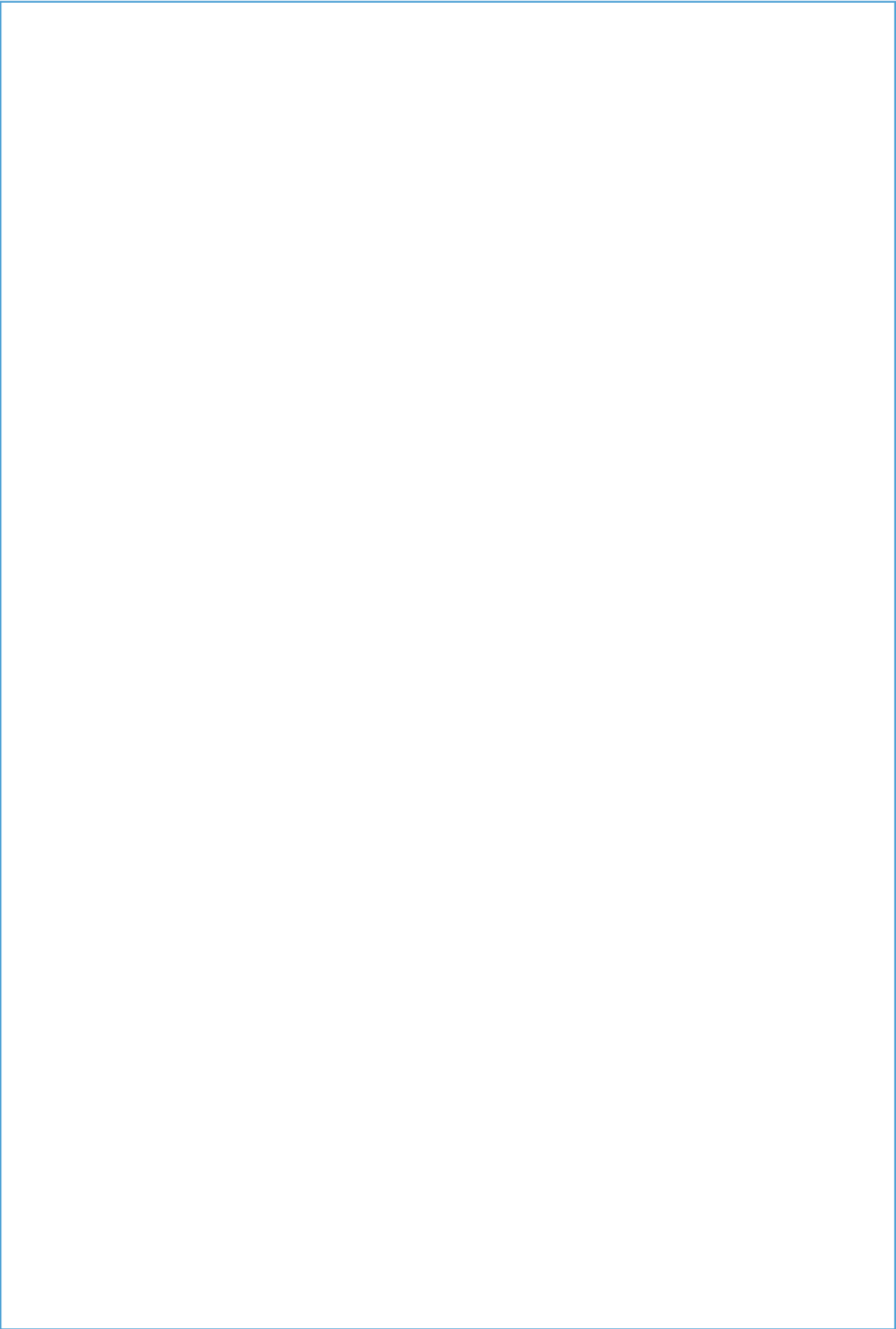
3. ECO-DESIGN FOR PLASTICS PRODUCTS

In order to drive our society towards resource efficiency and sustainability, more emphasis should be put not only on the recycling industry but also on the resource-efficient consumption by consumers. Increase in recycling rates would result in lesser demand for primary raw material and would help to reprocess and reuse resourceful waste which otherwise could be wasted on landfills. This would have an impact on reduction in energy consumption as well as greenhouse gas emissions. By means of improvement of plastic products design, it will be possible to lower energy consumption and to make products more accessible and convenient for recycling. Development in plastics recycling as well as increased plastics recycling rates is a drive towards innovation, creation of green employment, environment protection and resources efficiency. Recycling, which has become a normal practice in many European countries, will help to pave the way to longer term goals such as these for 2050, if supported with the necessary conditions for its growth.

6

NOTES







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