



Economic outlook for plastics recycling – the dual system's role



DerGrünePunkt

Core statements

Plastics recycling in Germany has huge development potential. A fully functional market for recyclates is already in place. The dual system has made a crucial contribution here, and in addition purposefully expanded its economic benefits. The situational conditions will play a vital role in further developments.

Applications and demand for premium recyclates are steadily increasing. Capital investment is essential for sustainably tapping this market. There is still, however, a lack of incentives. Higher quotas and improvements in enforcement would contribute towards utilizing the huge economic potentials of plastics recycling by the dual system to even better effect, as would giving more weight to ecological factors in fixing the participation fees, or extending product responsibility to non-packages made of the same materials.

Status quo

1. In Germany, a fully functional market for secondary raw materials has established itself since the 1990s

The market volume for recycled products made from post-consumer lightweight packages (plastic, aluminum, tinplate) nowadays comes to approximately 315 million euros. In particular, technical advances and the improved quality of recyclates were crucial in developing this market. The dual system has made a vital contribution to this. The major drivers behind this success story include the statutory quotas for material recycling laid down in the German Packaging Ordinance, opening up the dual system to competition, and the continuously rising level of acceptance for recycled products among companies and consumers.

2. The economic benefits of the dual system significantly exceed its costs

The total economic benefits achieved by the dual system, nowadays amounting to approx. 960 million euros, can be set against annual system costs of about 775 million euros, producing net benefits of 185 million euros. The dual system's economic benefits have increased over the course of time, while the system's costs, thanks to innovations and competition, have been substantially downsized. The dual system's CO₂ avoidance costs are nowadays running at 17 euros per ton of CO₂ saved, which is significantly lower than is the case with correspondingly targeted climate protection measures for increasing the use of regenerative energy –

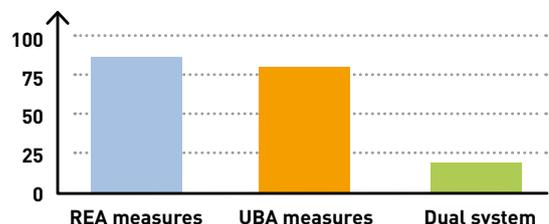
e.g. less than a fifth of the CO₂ avoidance costs entailed by regenerative energy sources on average under the Renewable Energies Act (REA). In a comparative study, the German Federal Environmental Agency (UBA) determined in 2014 average costs of 77 euros per ton of CO₂ saved.

3. Significant potentials remain untapped – a market for premium recyclates can evolve

Investments are frequently rejected as a viable option under the current situational conditions, but would be necessary in order to utilize to the full the dual system's available potentials in terms of collection, sorting, and recovery, and to open up a genuine market for premium recyclates. Moreover, there are still disincentives in place in fixing the participation fees that lead to reduced recyclability of packaging and lower quality of the input material for recycling.

CO₂ AVOIDANCE COSTS COMPARED

€/t CO₂ equivalents avoided





Outlook

4. The market for plastic recyclates has the potential to become a market worth billions

If existing potentials in collection, sorting, and recovery are harnessed, if non-packages made of the same materials are collected together with packaging, and a market for premium recyclates is created, then the market for plastic recyclates can by 2030 grow from its present-day 189 million euros to as much as 1.4 billion euros.

5. The economic benefits of the dual system could increase still further – by up to 40 percent

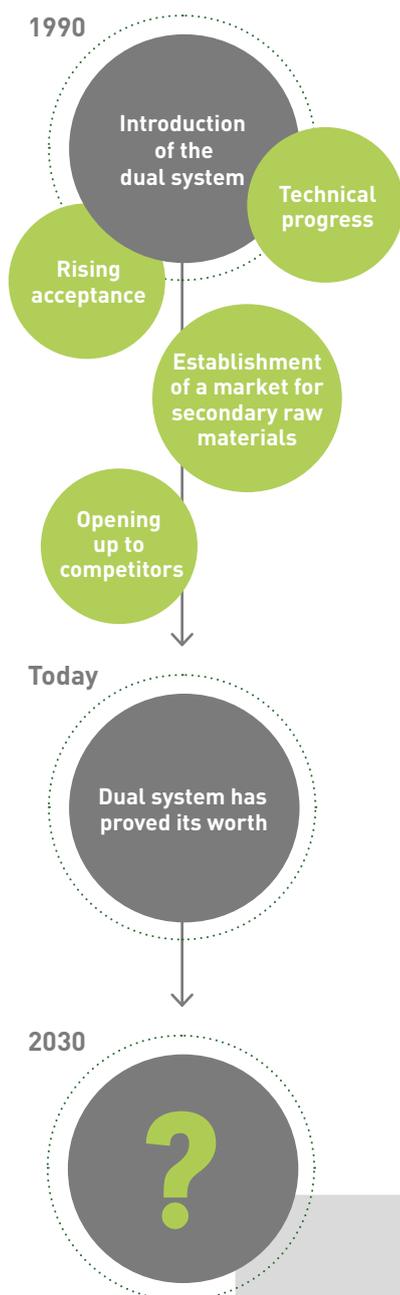
By harnessing the currently existent potentials (optimizing collection, sorting, and recovery, including non-packages made of the same materials, and higher quota stipulations), the annual economic benefits of the dual system could be significantly upsized from the present-day figure of 960 million euros to 1.3 billion euros. Admittedly, implementing these measures would entail costs but the net benefits of the dual system would nonetheless be substantially increased.

6. There is rising awareness of sustainability in the corporate environment, with concomitantly increasing demand for recyclates

Companies are attaching progressively more importance to their ecological image. In their decision-making, corporate social responsibility and instruments like product life-cycle analyses are gaining in perceived importance. New market fields for recyclates are opening up, particularly when the quality and availability of secondary raw materials are being further enhanced.

Market potential
for plastics
recycling in
2030

€ 1.4 bn



Background

More recycling! This formula is seen as a crucial step forward on the path leading to a more sustainable economy and society. In view of climate change, environmental pollution, population growth, and resource dependence, the closing of cycles is for many people not only an ecological imperative, but at the same time a crucial instrument for shaping the economy to meet and master the tasks of the future. This applies particularly to plastics, as a complex and comparatively young material, whose recovery involves special challenges and opportunities.

In the field of package recycling, Germany is one of the most important front-runners. In 1990, the legislature introduced product responsibility, and thus put in place the foundations for the first dual system tasked with the collection and recovery of packaging waste – Der Grüne Punkt GmbH. This was also a milestone on the path to closed material cycles, which nowadays constitute a role model for many countries inside and outside Europe. After being opened up to competition, the dual system in Germany comprises eleven system operators, and the Green Dot is used well beyond the country's borders. It is acknowledged as one of the best-known trademarks around, seen as a symbol for eco-awareness and resource-economy.

Today, the closed-cycle economy in Germany already subsumes more than 10,000 companies with over 250,000 employees.* Nonetheless, the transition from a linear to a closed-cycle economy is without a doubt still in its early stages. Flagship projects are indeed demonstrating with increasing effect that complex packages consisting largely or completely of recycle can prosper on the market, but these examples continue to require out-of-the-ordinary initiative from individual protagonists, most of them from the private sector. And even though the quality and quantity of secondary raw materials have made great advances in recent years, major challenges still remain in terms of scaling these solutions.

* BDE, ITAD, VDMA (2016): "Branchenbild der deutschen Kreislaufwirtschaft" (Structure of the German closed-cycle-economy sector)

But how can more plastics recycling be achieved? Where do its greatest potentials lie, and how can they be tapped? What role does the dual system play in this context? And what obstacles have to be overcome in order to close the cycles to better effect?

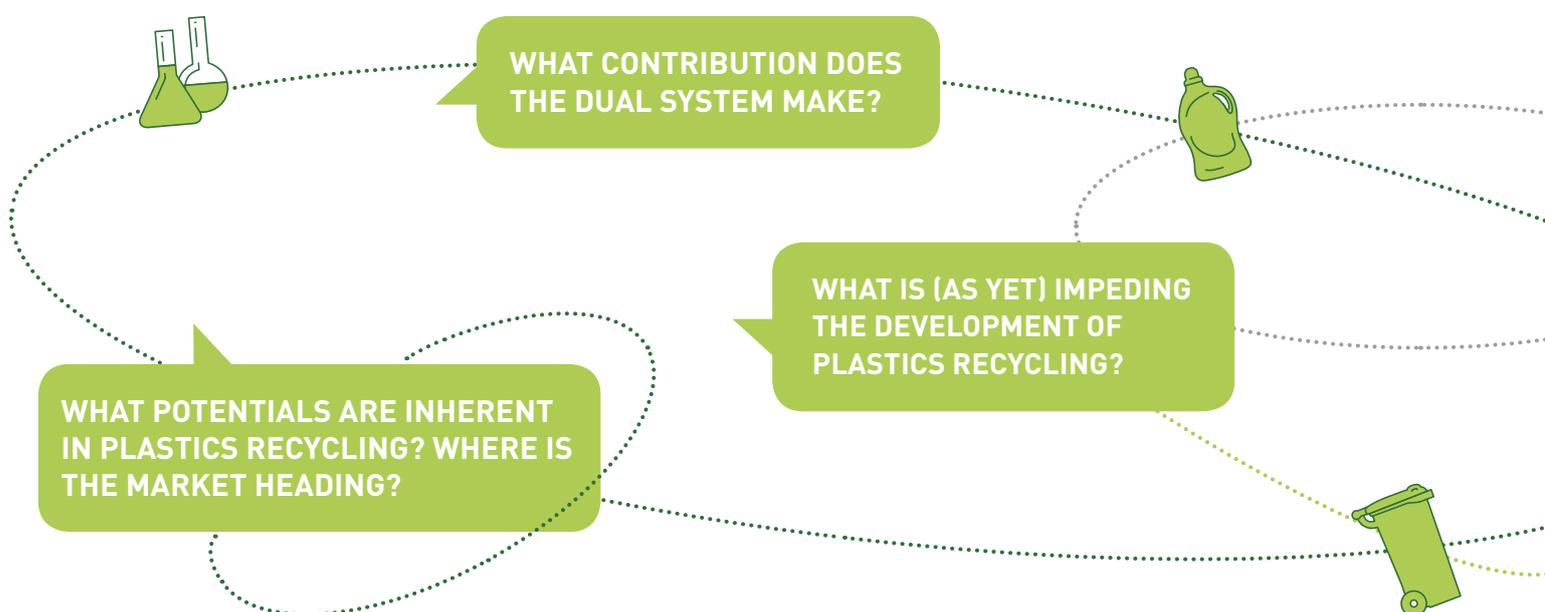
These questions have so far been posed, discussed, and examined predominantly from an ecological perspective. Technological aspects, too, such as design enhancement of separation and sorting technology, have so far not been tackled systematically in regard to their future potential for the closed-cycle economy. With a study entitled "Economic outlook for plastics recycling – the dual system's role," the RWI – Leibniz Institute For Economic Research, on behalf of DSD – Duales System Holding GmbH & Co. KG, has now examined these questions from an economic perspective. In this study, verified by an independent appraiser, the RWI also takes a look into the future. What is being signposted by ongoing developments and market trends? Under what conditions can the use of secondary raw materials made from post-consumer lightweight packages be expanded? How will the market develop? This study thus makes an important contribution towards the discussion on effective paths to a closed-cycle economy.

Approach and methodology

The RWI bases its findings on the figures provided in the most recent study from the Institute of Applied Ecology* on the ecological achievements and potentials of the dual system. The RWI analyses the data available using econometrically based forecasting procedures and utilizes interviews with experts along the value added chain so as to estimate the effects of ongoing technological developments and market trends.

In its study, the RWI adapts its methodology and approach to suit the key questions and the availability of the quantitative variables. Interviews with experts were used to draw up a picture of the latest advances, and their effects on the further development of plastics recycling. In all, the insights gained from more than 20 interviews with experts along the value added chain were incorporated (including: dual systems, recycling companies, sorting plant operators, first-time distributors). The exploration of future development scenarios for the dual system is based upon econometrically validated forecasts, such as Monte Carlo simulations.

The study focuses on the lightweight packages made of plastic collected by the dual system. But other material fractions from the Yellow Bin are also covered, like aluminum and tinfoil.



* Öko-Institut – Institute of Applied Ecology (2016): "Recycling is the future – ecological achievements and potential of the dual system" www-gruener-punkt.de/oeko-studie

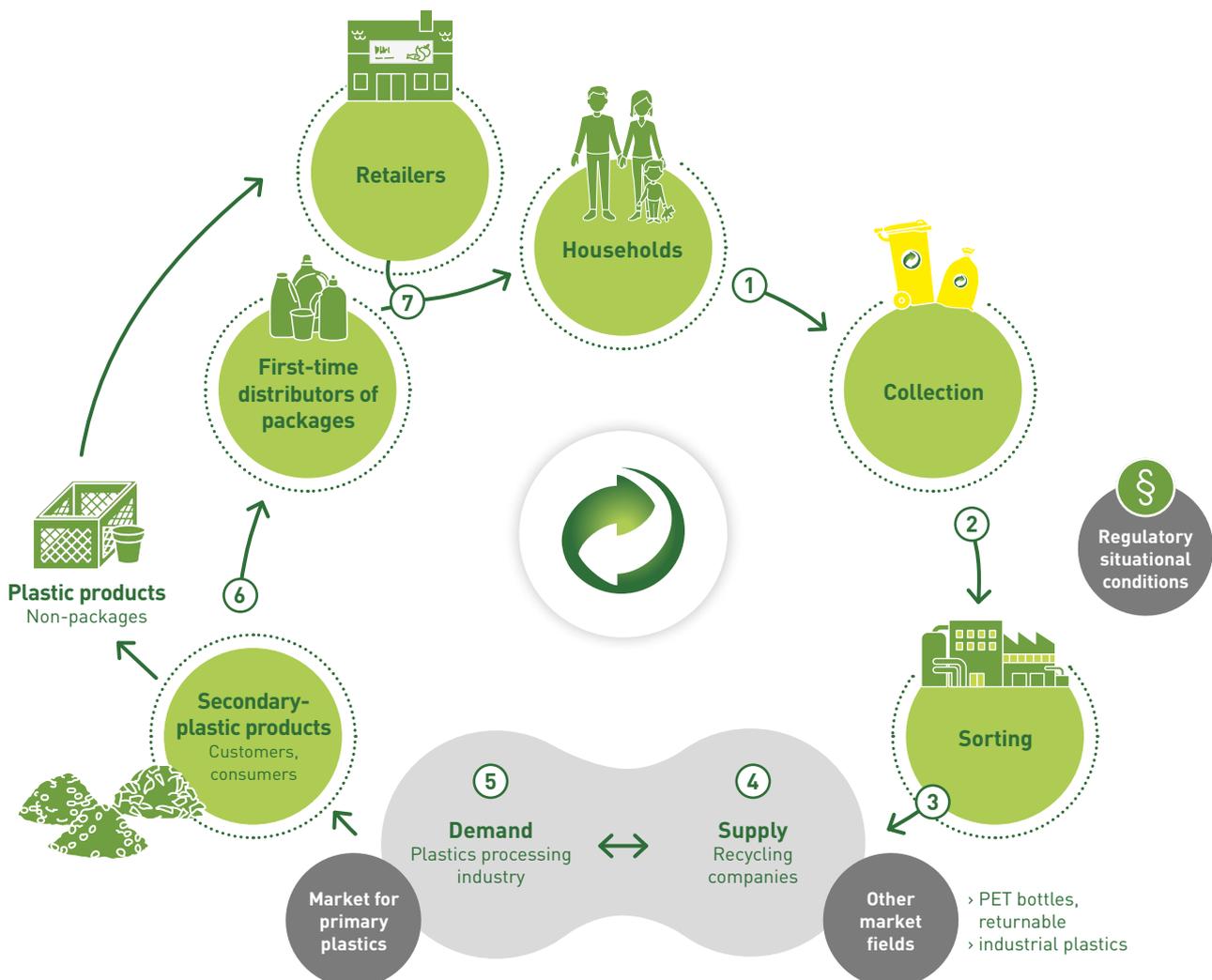
The basic model for plastics recycling

By establishing Der Grüne Punkt and the dual system for collecting and recovering packaging waste, a maximally interdependent system for plastics recycling was created in the early 1990s.

A comprehensive study of the dual system from an economic perspective is conditional upon an accurate picture of the relational interactions and causal interdependences obtaining in the overall system employed for plastics recycling. This is because here (even more emphatically than in other sectors of the economy) developmental advances are always dependent on the statutory situational conditions and market trends involved.

This is why the RWI's study began by using the results of the interviews with experts to create an overall model of plastics recycling. This model images the interdependences of the protagonists involved, and the role of the relevant markets, and maps out the influence of various determinants like technological and market developments. This not only enables the influence of the dual systems on the development of plastics recycling since 1990 to be estimated, but also makes it easier to identify the anticipated developments of the future, to answer the question of how ongoing developments will affect the progress of the sector, and to define the conditions under which plastics recycling can be advanced to optimum effect.

Plastics recycling – an interdependent system



Development thrusts for plastics recycling

Where does plastics recycling in Germany stand today, and what are the most recent developments signposting? In order to answer this question, the RWI has examined the specific economic benefits of the dual system and is estimating the future development of the market for plastic recyclates on the basis of four scenarios.



Status quo

In Germany, a fully functional market for secondary raw materials is already in place – the dual system has made a crucial contribution here.

After an initial start-up phase following the introduction of the dual system in 1990, a smoothly functioning market for products made from post-consumer waste has developed in Germany, particularly after 2000. The paramount influencing factors here were technical advances in sorting equipment, especially the introduction of automated separation, which has led to substantially improved efficiency and higher sorting purity. In addition, vital impetus has been imparted by the quotas for material recycling stipulated in the relevant legislation, by the opening up of the dual system to competition as from 2003, and the continuingly rising levels of acceptance for recycled products among companies and private consumers.

Thanks to the technological advances, the quality of post-consumer recyclates has been upgraded, and the pricing gap to secondary plastics from the post-industrial category has increasingly been closed. In comparison to primary plastics, too, the price differential for recyclates from the post-consumer category has been reduced by higher quality, better sales channels, and higher quantitative availability. The market for recycled products made from post-consumer lightweight packages (plastic, aluminum, tinplate) nowadays has an estimated volume of approximately 315 million euros.

The economic benefits of the dual system today significantly exceed its costs

In order to quantify the dual system's economic benefits, the RWI has identified the relevant benefit and cost factors involved. The focus here is on recycling post-consumer lightweight packages. The basic assumption behind the calculations is the premise that the lightweight packages collected in the Yellow Bin or the Yellow Sack would have remained in residual waste without the introduction of the dual system.

BENEFIT AND COST FACTORS OF THE DUAL SYSTEM

€ Cost reductions for residual-waste disposal

⚡ Incineration with energy recovery as a substitute fuel

♻️ Market for regranulates made from lightweight packages

👥 Jobs

CO₂ Savings of CO₂ equivalents

€⚙️ System and transaction costs

→ **BENEFITS: 960 MILLION EUROS PER ANNUM**

Economic benefits of the dual system

In 2014, the net economic benefits of the dual system came to around 185 million euros. These benefits can be broken down as follows:

Reduced costs for residual-waste disposal

Thanks to introduction of the dual system, the quantity of residual waste has fallen by approximately 16 percent – which means the costs of residual-waste disposal have decreased by approximately **550 million euros**.

Market for regranulates made from lightweight packages

Thanks to the dual system, and the plastic regranulates made from lightweight packages it has put into circulation, there have been savings in terms of aluminum, tinplate, and primary materials. The economic benefits from savings that reflect the price differential between primary and secondary raw materials come to approximately **180 million euros**.

In addition, the dual system makes a contribution towards security of supply, since this means reduced dependence on primary materials, which frequently have to be imported.

Savings of CO₂ equivalents

Thanks to the dual system, a total of **2.72 million tons of CO₂ equivalents** are saved each year – this corresponds to the quantity of greenhouse gases emitted in one year by almost 750,000 compact-class cars. The quantity of CO₂ thus saved is calculated at an average of German Renewable Energies Act avoidance costs quantified at about 85 euros per ton of CO₂ equivalents, in order to determine the economic benefits of around 230 million euros. The CO₂ avoidance costs of the dual system are exceptionally low, at 17 euros per ton of CO₂ saved. Other studies*, for example, have quantified the CO₂ avoidance costs per ton due to expanding the use of regenerative energy sources in the framework of the German Renewable Energies Act at 85 euros. In a comparative study conducted in 2014, the German Federal Environmental Agency determined average costs of 77 euros per ton of CO₂ saved.

Incineration with energy recovery as a substitute fuel

Substitute fuels replace fossil energy sources in cement works, for example. The economic benefits relate firstly to savings of CO₂ and to lower additional payments to substitute fuel treatment companies in comparison to refuse incineration, for example. These economic benefits arising from savings in CO₂ equivalents and the lower additional payments to substitute fuel treatment companies, however, have already been factored into the other benefit factors. For this reason, no explicit additional benefits are shown here.

Jobs

In the recycling sector, approximately **10,000 jobs** have been created. The jobs thus saved at primary production facilities relate predominantly to foreign countries. This factor has not been converted into a specifically quantified benefit.

System and transaction costs

The system costs for collecting, sorting and treatment, and for material recycling plus incineration with energy recovery of the lightweight packages are calculated from the licensing costs and the transaction costs for first-time distribution of sales packages, and are running at **750 million euros** (system costs) and **25 million euros** (transaction costs).

The total benefits of the dual system in the lightweight packaging category add up to **approximately 960 million euros**, while the system costs come to **about 775 million euros**. Thus at present the benefits of the dual system exceed the concomitant costs by about 185 million euros. While the system's economic benefits have steadily increased over the course of time, the system costs have progressively fallen, thanks to technical advances and the introduction of competition. Thus over the course of time efficiency has been upgraded and the cost-benefit ratio has consequently become more favorable.

* Franke, M., K. Reh and P. Hense (2014): „Ökoeffizienz in der Kunststoffverwertung“ (“Eco-Efficiency in Plastics Recycling”)

A market is forming for premium recyclates – but substantial potentials still remain untapped

Favorable market conditions for recyclates are foreseeable due to the steadily growing levels of acceptance for products and packages made of secondary raw materials and the continually rising quality of the recyclates involved. Flagship projects – frequently involving explicit initiatives by protagonists from the private sector – show that a market for premium recyclates can emerge. These projects play an important role as door openers.

Nevertheless there are still some considerable opportunities for optimization, since the current situational conditions for plastics recycling are preventing the existing potentials from being tapped or precluding this possibility. Disincentives, for instance, are leading to reduced recyclability of packaging and to a lower quality of the input materials for recycling. In particular, the recycling quotas currently in force are not high enough to constitute an incentive for exhausting the potentials of existing technology.

For years, moreover, due to the ongoing political discussions regarding future regulatory situational conditions, there has been significant uncertainty – and consequently a veritable backlog in terms of capital investment in recycling facilities. These investments, however, would be essential in order to utilize to the full the existing potentials of the dual system and open up new markets on a sustainable basis. Relevant technologies for improving the sorting and recycling of post-consumer lightweight packages are already available, and very largely mature.



Prospects for plastics recycling: 2030

To enable statements to be made on the possible future development of the market for recyclates, the RWI has used four scenarios to examine the influence of various relevant situational conditions for the period up to 2030. These scenarios for the first time offer a basis for a sound estimate quantifying the economic potentials of plastics recycling.



In the **BASIC SCENARIO**, econometric procedures are used to estimate the further developments that would ensue without any changes to the current institutional situational conditions and with an unaltered market structure.



In **SCENARIO 1**, the market development is presented on the basis of estimated quantities for lightweight plastic packages, as resulting from increased quotas and the use of technical potentials for sorting, separation and treatment.



In **SCENARIO 2**, the recycling of non-packages made of the same materials is also factored in.



In **SCENARIO 3**, the effects of a favorable market development and enhanced product quality on the demand for recycled plastics are examined, together with the resultant effects on the market volume.

The market for plastic recyclates has abundant potential

Development
2014 to
2030

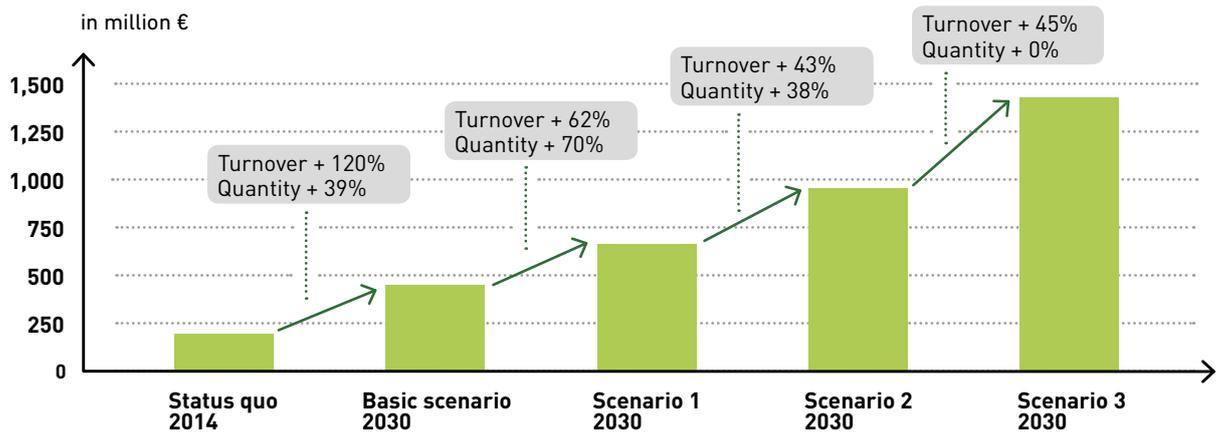
7-fold
market
volume

The results show that plastics recycling in Germany has substantial inherent potential. In 2014, the market volume for plastic recyclates was running at 189 million euros. In the basic scenario, the market for regranelates will by 2030 have grown by 119 percent to reach 414 million euros – given unchanged structures and demand conditions. By using the technical options available, and with improved situational conditions and favorably developing levels of demand as compared to this basic scenario, it will then even be possible to triple the market volume to more than 1.4 billion euros. Compared to 2014, this would correspond to a more-than-sevenfold rise in market volume. A development of this kind, however,

will be conditional upon tapping into new customer groupings.

It is noteworthy how much inherent potential the system already possesses. This is because firstly the scenarios do not postulate any substantial technological advances, but merely nationwide use of today's leading-edge technology. Secondly, the situational changes factored into the scenarios have long since already formed part of the political discussion, and in some cases may soon be implemented, under the aegis of the German Packaging Act, which demands more ambitious quotas, for example.

Development of the market potential for plastic recyclates



Source: own calculations, RWI.

The economic benefits of the dual system could increase still further

The present-day economic benefits of the dual system, totaling approximately 960 million euros, could increase still further given rigorously purposeful use of the existing potentials. An additional improvement in the institutional situational conditions – thanks to higher quotas and the introduction of the Recyclables Bin – would

even upsize the economic benefits of the dual system to approximately 1.33 billion euros. These measures would admittedly entail higher system costs, but the net benefits of the dual system would nonetheless rise substantially.

Companies are increasingly taking ecological considerations on board, thus opening up markets for recyclates

At the same time, the willingness of packaging manufacturers to use secondary raw materials, not least for reasons of sustainability, has increased significantly, since companies are attaching ever-greater importance to their ecological image, and in entrepreneurial decisions corporate social responsibility and instruments like product life-cycle analyses are gaining steadily in perceived significance.

If the availability of recyclates featuring consistent qualities is expanded, this will create new markets for premium recyclates. The ecological advantage achieved by using recycled materials can also contribute towards progressing convergence between the prices for recyclates and primary goods.



Conclusions and recommendations

There is an immense potential for plastics recycling in Germany. A properly functioning market for recyclates is already in place, especially in the category of simple applications. However, the demand for premium recyclates is steadily rising.

New application categories are being tapped – frequently still within the framework of flagship projects. The RWI study shows that the recycling of post-consumer lightweight packages in Germany is at an important turning point. Opening up markets for premium recyclates on an industrial scale would be tantamount to a breakthrough. The results of the study also make it clear that this is the right course to adopt, not only out of ecological considerations, but for economic reasons as well.

The principle of closing cycles and recycling more materials, instead of incinerating them, should therefore be ambitiously progressed, because capital investment is vital in order to open up markets for premium recyclates and utilizing the potential of the dual system to full effect. There are still disincentives in place, and the existing situational conditions have led to an investment backlog.

Higher quotas and factual improvements in enforcement (meaningful specialist regulation and the possibility of rigorous sanctions against violations by all protagonists involved) would be a potent source of leverage for releasing the economic potentials of plastics recycling by the dual system, as would giving more weight to ecological factors in fixing the participation fees, or extending product responsibility to non-packages made of the same materials. The German Packaging Act can play a vital role in this context, and impart crucial impetus to developments in the field of recycling. This would trigger increased recycling – and constitute an important step forward in the thrust for a genuine closed-cycle economy.

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Responsible under German press legislation	Helmut Schmitz
Editor	Norbert Völl
Paper	160 g/m Cocoon (recycled, white, Blue Angel + FSC Cert.)
Printshop	Druckerei Johann Gumbinnenstr. 2 D-56566 Neuwied
Status	October 2016