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# The Environmental Economy in Germany 2015

Development, Structure and International Competitiveness



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## Key points at a glance

Environmental protection has long been established as an important factor for the German economy. In 2013, for example, companies produced goods worth €82 billion that were capable of being used for environmental protection purposes. This amounts to 6% of total production by German industry. German companies also enjoy a good position in international competition: with a 14.8% share of world trade in 2013, Germany was once again the biggest exporter of environmental protection goods.

However, developments in the solar power industry show clearly that this good position cannot be taken for granted. In both 2012 and 2013 production of solar cells in Germany fell by more than 50%, and the annual drop in other solar energy goods was more than 20%. This sharp drop was only partly offset by production growth in other sectors, such as wind power, wastewater treatment, or process, measurement and control technology. There was therefore a slight decrease in production of potential environmental protection goods, from €85 billion in 2011 to €82 billion in 2013.

On a global scale, by contrast, there is a growing demand for environmental protection and climate change mitigation technologies and for products that are eco-friendly and help to conserve resources. As a result, the economic importance of environmental protection will continue to increase in the future. In all regions of the world and all environmental sectors, there is currently a clear preference for environmental protection goods and technologies from Germany, but competition is growing.

Like industry in general, the environmental economy in Germany is dominated by small and medium enterprises. However, despite the large number of smaller suppliers, large businesses account for a greater volume of sales. The main sectoral focus is in the mechanical engineering sector, which is important for several environmental segments.

# 1 The environmental economy as a cross-sectional industry

The environmental economy comprises all companies that supply environmental protection goods and services. The range of products and services covers such varied fields as waste management and recycling, water conservation and wastewater treatment, air quality control, noise abatement, and measurement and control technology. It also includes climate change mitigation, which comprises the use of renewable energy sources and efficient use and conversion of energy.

The spectrum of goods manufactured is correspondingly broad: pumps, air filters, pipes, waste collection containers, silencers etc. are used in waste treatment, air quality control or noise abatement. Environmental protection goods include installations for generating electricity from renewable energy sources (e.g. wind energy and solar energy systems), and also “smart meters” for controlling electricity consumption. Also of great importance are environment-related services: examples include energy consulting, trade in eco-friendly products, or product support services in the service and maintenance sector.

Whereas most other sectors of industry can be defined in terms of the nature of the material, the technologies used or the purpose of the goods and/or services, this is hardly possible in the environmental protection sector: it covers a broad spectrum of environmental fields, technological orientations (additive or integrated) and supplies (goods, services, components). The situation is also complicated by the fact that environmental protection requirements change in the course of time. It is therefore impossible to lay down an official definition of the environmental economy as a branch of indus-

try – and especially not one that permits comparative international studies<sup>1</sup>.

Analyses at the level of goods are therefore undertaken to assess the significance of environmental protection for the economy as a whole and the performance of the German environmental economy. These studies include goods that are not produced exclusively for environmental protection purposes. They also take in goods which could by their nature – i.e. potentially – serve the interests of environmental protection. Since internationally comparable statistics are available on the production of and trade in (potential) environmental protection goods, this approach also makes it possible to examine the position of German industry in relation to the international competition in such goods. The remarks in Chapters 2 to 4 of this background paper are based on this potential-oriented approach. However, these analyses at goods level do not permit any conclusions at company level. They are therefore supplemented in this background paper by an evaluation of the Federal Statistical Office’s “survey of goods, construction work and services for environmental protection” (Chapter 5). The findings set out in this background paper are taken from a recent study undertaken by the Lower Saxony Institute for Economic Research (NIW) for the Federal Environment Agency (Gehrke and Schasse, 2015a).

## What are potential environmental protection goods?

Potential environmental protection goods can serve environmental protection purposes, but they may also perform other functions. They include such goods as pumps, pipes, and measurement and control equipment. The concept of potential environmental protection goods was developed in the 1990s by research establishments in cooperation with the Federal Statistical Office. Since then it has been used for studies examining the performance of the German environmental economy. It is based on a list of goods that are capable of being used for environmental protection and climate change mitigation purposes. In 2013, at the request of the Federal Environment Agency, this list was thoroughly revised to bring it into line with the current state of the art and take account of changes in the statistical database (Gehrke and Schasse, 2013; Gehrke and Schasse, 2015b).

## 2 Development of production of potential environmental protection goods

In 2013, companies in Germany produced potential environmental protection goods worth nearly €82 billion. As a result, 6% of total production by German industry was due to environmental protection goods<sup>ii</sup>.

In the upturn following the crisis of 2009, production of environmental protection goods showed a rise of 25% by 2011 to €85 billion, the highest ever figure at that point. In the following years, 2012 and 2013, it fell again. The reason was a massive drop in the solar energy sector (photovoltaic/solar cells and other solar energy goods including their installation), which was reflected in a sizeable reduction in the production of goods for using renewable energy sources (cf. Table 1). Although production in the fields of wind power

and biomass rose at the same time and the production of goods for efficient use and conversion of energy remained largely stable, this resulted in substantial production losses in the climate mitigation goods sector: by more than 6% between 2011 and 2012, and a further 5% by 2013. In 2013, goods capable of contributing to climate change mitigation nevertheless still accounted for over 40% of the total production of environmental protection goods. Production in the traditional sectors – waste, noise and air – displayed overall stagnation from 2011 to 2013. By contrast, growth was observed in the wastewater and measurement and control technology sectors.

Table 1

### Production of potential environmental protection goods in Germany, broken down by environmental sectors

Environmental sector	Production in billion EUR					Change in %		
	2009	2010	2011	2012	2013	2009/11	2011/12	2012/13
Waste	7.8	8.9	10.2	10.2	10.3	31.0	-0.5	0.6
Wastewater	14.0	14.6	16.1	16.2	16.8	15.6	0.4	3.6
Noise	3.6	4.3	5.3	5.5	5.4	47.4	2.5	-1.8
Air	5.2	6.2	7.6	7.6	7.3	45.3	0.3	-3.3
Measurement and control	5.2	6.0	6.7	6.9	7.0	29.3	2.1	2.2
Climate change mitigation	30.2	34.3	37.5	35.1	33.3	24.1	-6.3	-5.1
of which:								
Goods for efficient use of energy	14.7	16.3	17.9	18.1	18.1	21.3	1.4	0.0
Goods for efficient energy conversion	2.3	2.7	2.7	2.9	2.6	17.2	6.0	-10.2
Goods for use of renewable energy sources	13.1	15.2	16.8	14.0	12.5	28.5	-16.6	-10.8
<b>Total environmental protection goods</b>	<b>67.7</b>	<b>76.2</b>	<b>84.8</b>	<b>83.7</b>	<b>81.6</b>	<b>25.2</b>	<b>-1.3</b>	<b>-2.5</b>
For information:								
Total manufactured production	1,065	1,231	1,366	1,370	1,370	28.2	0.3	0.1

\* including groups of goods that cannot be allocated for confidentiality reasons

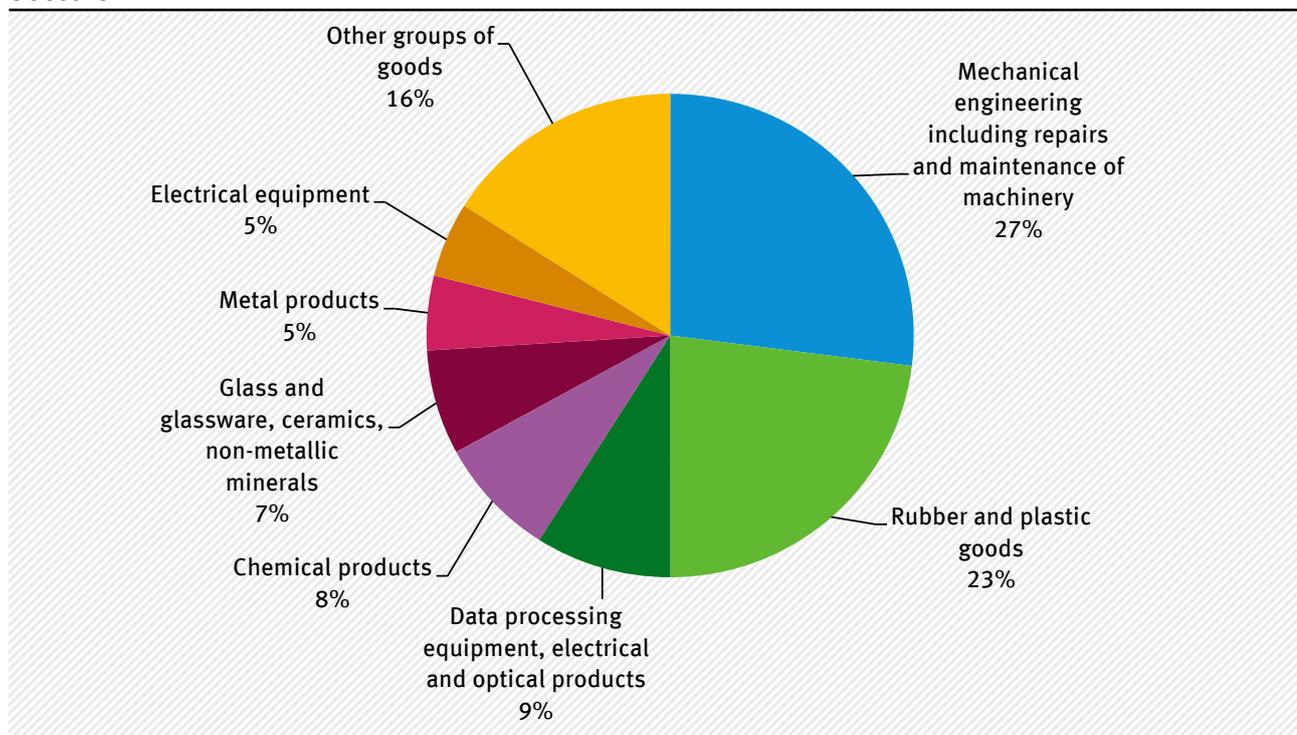
Source: Gehrke and Schasse (2015a), p. 44

A glance at the breakdown by sectors shows that half of all environmental protection goods are produced in only two branches of industry: mechanical engineering and the rubber and plastics sector (cf. Fig. 1). The two branches are important for several environmental sectors. For example, mechanical engineering products account for over 88% of the production of goods for efficient energy conversion and about one third of goods for air quality control and wastewater treatment. Rubber and plastic products are used particularly in the waste management sector (containers, pipes and other components) and for noise abatement (sound insulation). They are also needed to save en-

ergy (efficient use of energy). The drop in production in the photovoltaic sector primarily affected the fields “data processing equipment, electronic and optical products” and “electrical equipment”. Here the total production volume fell from its peak of €15 billion in 2011 to €11.1 billion.

Fig. 1:

**Production of potential environmental protection goods in 2013, broken down by industrial sectors**



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 46

**Empirical basis: Data from production and foreign trade statistics**

Official data from the production and foreign trade statistics form the empirical basis for estimating the production volume of the environmental economy and its position in international competition. The list of potential environmental and climate protection goods that is used for these estimates makes it possible to determine the value of the production, export and import volumes of industrial goods capable of being used for environmental protection purposes. Comparable statistics are available worldwide. It is therefore possible to examine Germany’s competitive position at the level of potential environmental protection goods. In the field of environmental protection services there is no internationally comparable basis of data. The results set out in Chapters 2 to 4 therefore relate solely to the production of industrial goods. The results in Chapter 5 consider services as well.

### 3 The environmental economy in international competition

#### Environmental protection – a global growth market

Businesses in the environmental economy operate on global markets. They make a large proportion of their growth outside Germany. Even if they are not active on the export front, they frequently compete with international companies on the domestic market. The performance of the environmental economy therefore has to be measured by international standards – especially since the growth and development opportunities of the German environmental economy will continue to depend heavily on exports in the future.

Exports of potential environmental protection goods showed worldwide growth averaging 10.3% per annum from 2002 to 2013, which was considerably faster than the growth of world trade in industrial goods as a whole (8.7%). This dynamic trend was due particularly to developments in the years 2002 to 2008. During this period, exports of environmental protection goods grew by 18% per annum. In the following years up to 2013, growth slowed consider-

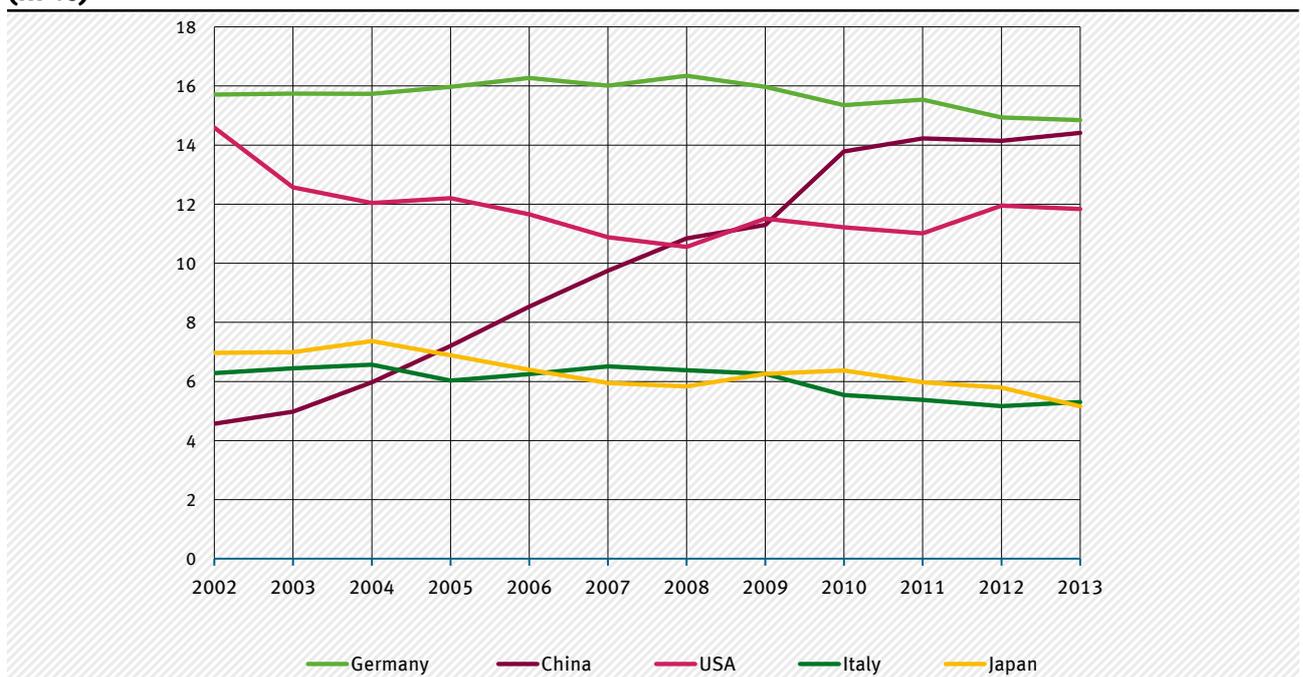
ably: at an annual average of only 1.9% it was below the growth rate for industrial goods as a whole (3.1% per annum). German exports showed a similar trend to worldwide exports. Accordingly, potential environmental protection goods as a share of total German exports of goods first rose from 4.0% (2002) to 5.1% (2009/10), before falling back to 4.9% (2012/2013).

In 2013, German industry exported environmental protection goods worth €50.3 billion. This is equivalent to a 14.8% share of world trade (cf. Fig. 2). Thus Germany remained the largest exporter of environmental protection goods, closely followed by China.

China's share of international trade in potential environmental protection goods has trebled over the past decade. Other emerging economies are also gaining ground as suppliers. By contrast, the major OECD countries have recorded significant losses in their export shares over the last 10 years.

Fig. 2:

#### World trade shares of the largest suppliers of potential environmental protection goods (in %)



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 53<sup>11</sup>

There have also been marked shifts in the centres of demand for environmental protection goods: away from the developed industrialised countries and towards the emerging economies in Central and Eastern Europe, Asia (especially China) and South America. German suppliers have been more successful than competitors from other highly developed European countries in taking advantage of these opportunities and participating in the growth of imports in these regions. German environmental protection goods are in demand in all regions around the world and across all environmental sectors (cf. Gehrke and Schasse, 2015).

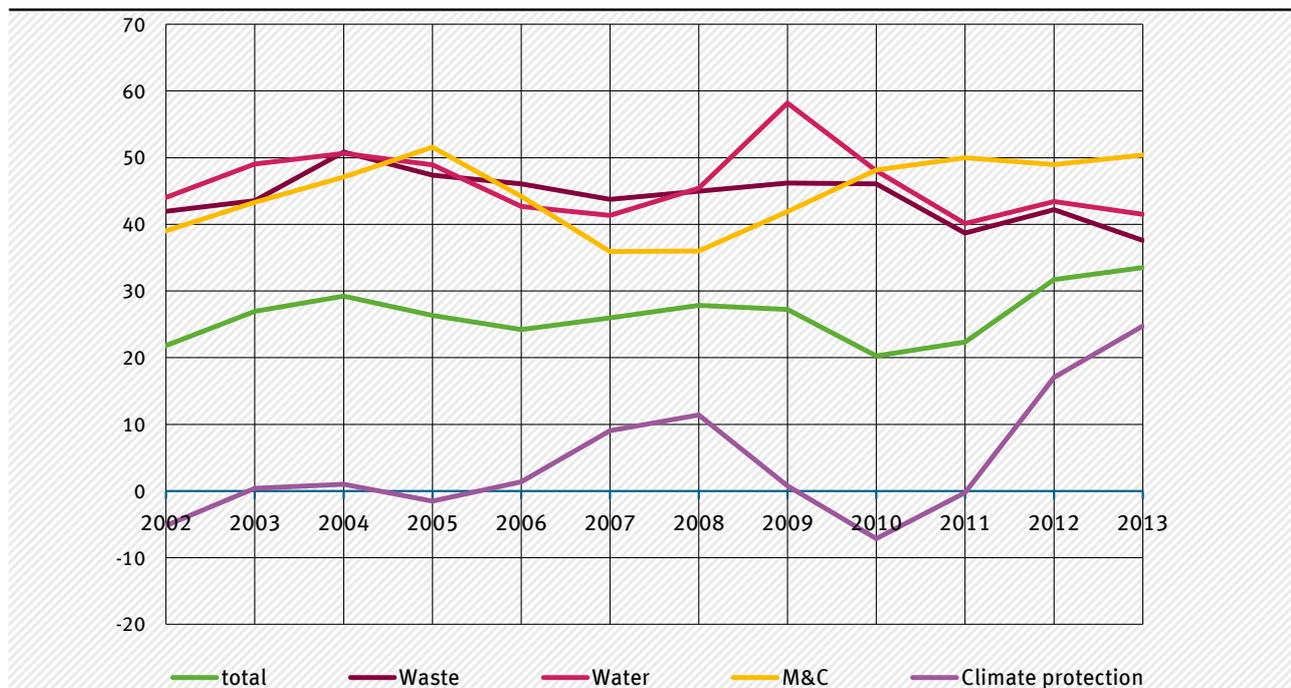
### Competition in Germany – how imports have developed

Not only exports, but also imports are a relevant indicator when considering the international competitive position of a group of goods. This is because German companies' products have to compete with foreign suppliers as well, even within Germany. International competition also plays a role on the domestic market. One index that takes account of both a country's exports

and its imports to identify the advantages of specialising in a particular group of goods is the "revealed comparative advantage" (RCA for short<sup>iv</sup>). Measured by the yardstick of the RCA, German industry is traditionally particularly strong in the fields of measurement and control technology and waste and wastewater technologies (cf. Fig. 3). Export specialisation in the field of potential climate protection goods was less marked in the years 2010/2011: imported climate protection goods recorded above-average increases in their market shares in Germany. In 2012/2013 this trend was reversed, but not because of a revival of the competitive strength of German industry. The reason was in fact the changes in funding conditions for the solar sector. These resulted in a specific drop in demand which not only affected domestic production, but also had an impact on imports.

Fig. 3:

### German specialisation in potential environmental protection goods, broken down by environmental sectors (measured using RCA)



A positive RCA means that the export-import ratio for a particular product group is higher than for processed industrial goods as a whole. The higher the RCA, the more successfully German companies are maintaining their position on the domestic market in the face of foreign competition.

Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 56

## 4 In focus: the market for climate protection goods

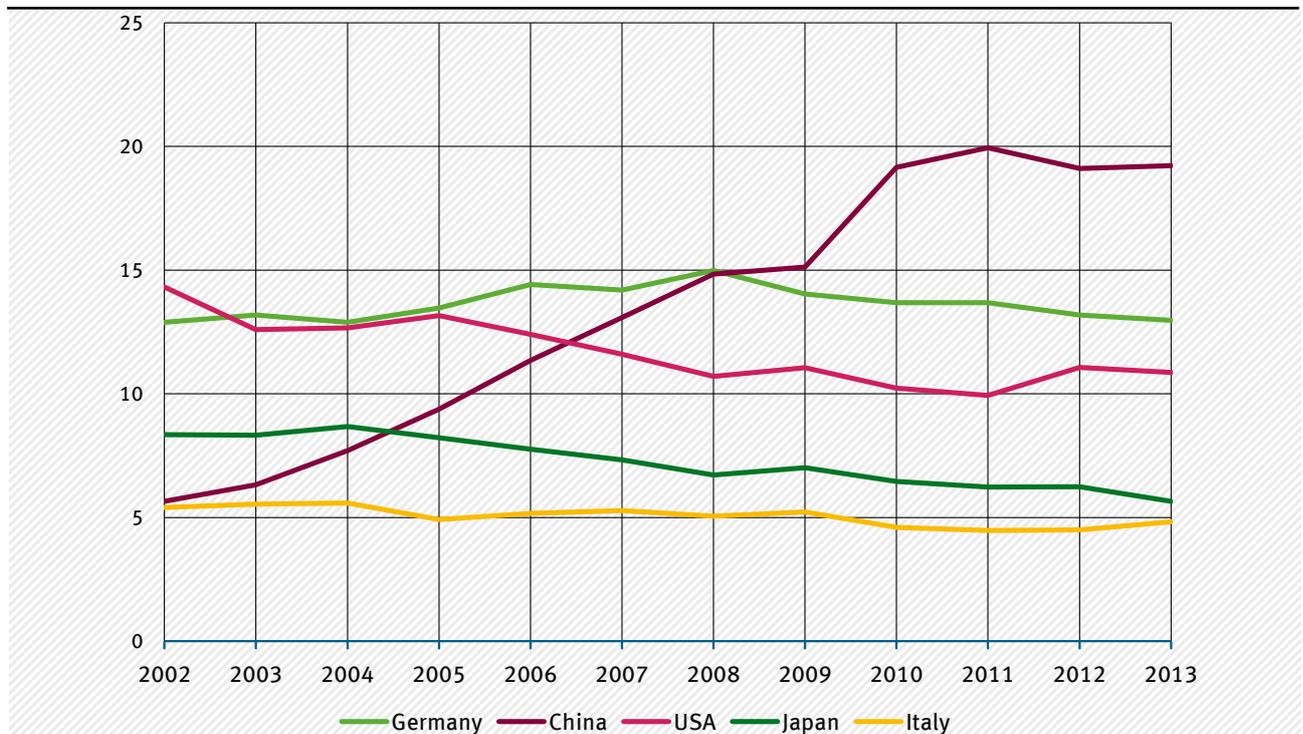
World trade in climate protection goods has displayed a similar trend to world trade in environmental protection goods and has had a major influence on the latter. In 2013 Germany was the second largest exporter of potential climate protection goods, with a 13% share of world trade (cf. Fig. 4). The trend in China is remarkable: its share of global trade in climate protection goods more than trebled from 5.7% to 19.9% between 2002 and 2011. Since then, however, there has been no further increase in China's share.

Environmental activities since the mid-1990s have largely focused on climate change mitigation. This has led to ongoing expansion of global capacities for making use of renewable energy sources. In recent years this expansion has increasingly shifted away from the highly developed countries of North America and Europe, and towards Asia (especially China), Oceania, Central and South America and the Middle East (REN 21, 2014).

Despite continuing growth in capacity, the investment volume has slackened off in the recent past, which is due among other things to substantial reductions in costs and improvements in efficiency. Especially in the solar sector, there has been a disproportionate increase in the pressure of competition owing to the growing number of producers in Asia. This has resulted in a considerable drop in prices of cells and modules. According to the Working Group on Renewable Energies – Statistics, investment in installations for using renewable energy fell in Germany by nearly 20% in 2013 compared with the year before (BMW, 2014). Investment activities were also depressed by the sharp drop in payment rates.

Fig. 4:

### World trade shares of the largest suppliers of potential climate protection goods (in %)



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 68

In 2013, German industry exported climate protection goods worth over €19 billion. This corresponds to 38% of its total exports of potential environmental protection goods. In 2010, however, the share due to climate protection goods was substantially higher, at nearly 42%. A similar trend can be seen in imports of climate protection goods. Here the share of total imports of environmental protection goods fell from nearly 55% in 2010 to just under 42% or €10.8 billion in 2013. This was largely due to declining imports of goods for the use of renewable energy sources.

A glance at the longer-term trend in the field of renewable energy sources shows that the ratio of exports to imports was more or less balanced until 2005, after which there was an above-average increase in exports (Fig. 5). In the years that followed, the volume of trade continued increasing until 2010/2011, with imports growing considerably faster than exports. As a result, the ratio of exports to imports gradually became more evenly balanced again. Since then, the flow of trade in both directions has displayed a downward trend, with imports falling much faster than exports.

As explained above, this trend reflects the demand for solar cells and hence the installation of new solar and photovoltaic systems. Whereas solar cells and modules accounted for nearly 60% of German imports for the use of renewable energy sources in the peak imports year 2010, the figure for 2013 was only around 22% (Table 2). The decline in exports is largely connected with the decline in the competitiveness of German prices compared with Asian producers (especially in China and Taiwan).

With nearly three quarters of imports and 62% of exports, solar energy goods still clearly dominate German foreign trade in installations for the use of renewable energy sources (Table 2). In the case of imports, however, the focus has shifted away from solar cells and modules in the direction of other solar energy goods. On the exports front, goods in the field of wind power have become more important. The other renewable energy segments (hydro power, biomass/biogas, heat pumps) play only a relatively minor role.

Table 2

### Structure of German foreign trade in goods for using renewable energy sources

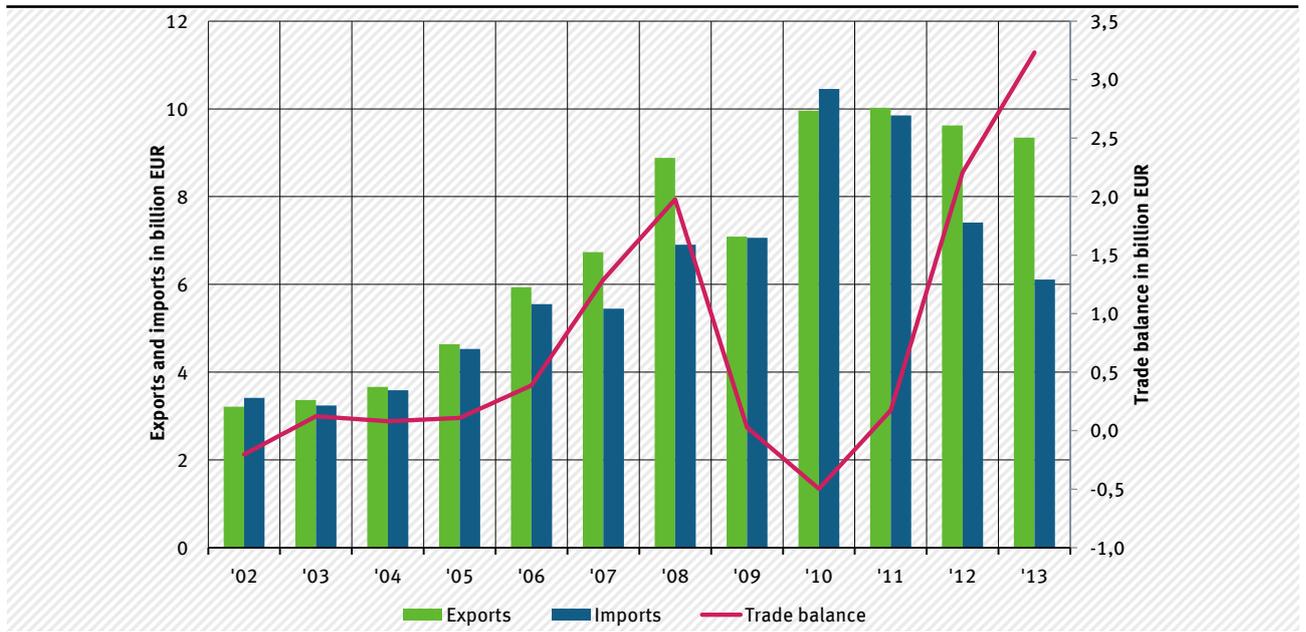
	Exports	Imports	Exports	Imports	Exports	Imports
	2002		2010		2013	
<b>Total (billion EUR)</b>	3.2	3.4	10.0	10.5	9.3	6.1
of which (%):						
Wind energy	11.2	24.0	15.7	8.9	28.9	17.5
Solar energy	71.9	66.0	75.6	87.5	61.8	74.3
Solar cells and modules	8.6	13.4	30.7	57.9	14.1	21.8
Other solar energy goods	63.3	52.6	44.9	29.7	47.8	52.4
Other energy sources*	16.9	9.9	8.6	3.6	9.3	8.2

\*) Hydro power, heat pumps, biomass/biogas.

Source: Gehrke and Schasse (2015a), p. 67

Fig. 5:

### Balance of German foreign trade in goods for using renewable energy sources



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 67

## 5 Industries and company sizes in the environmental economy

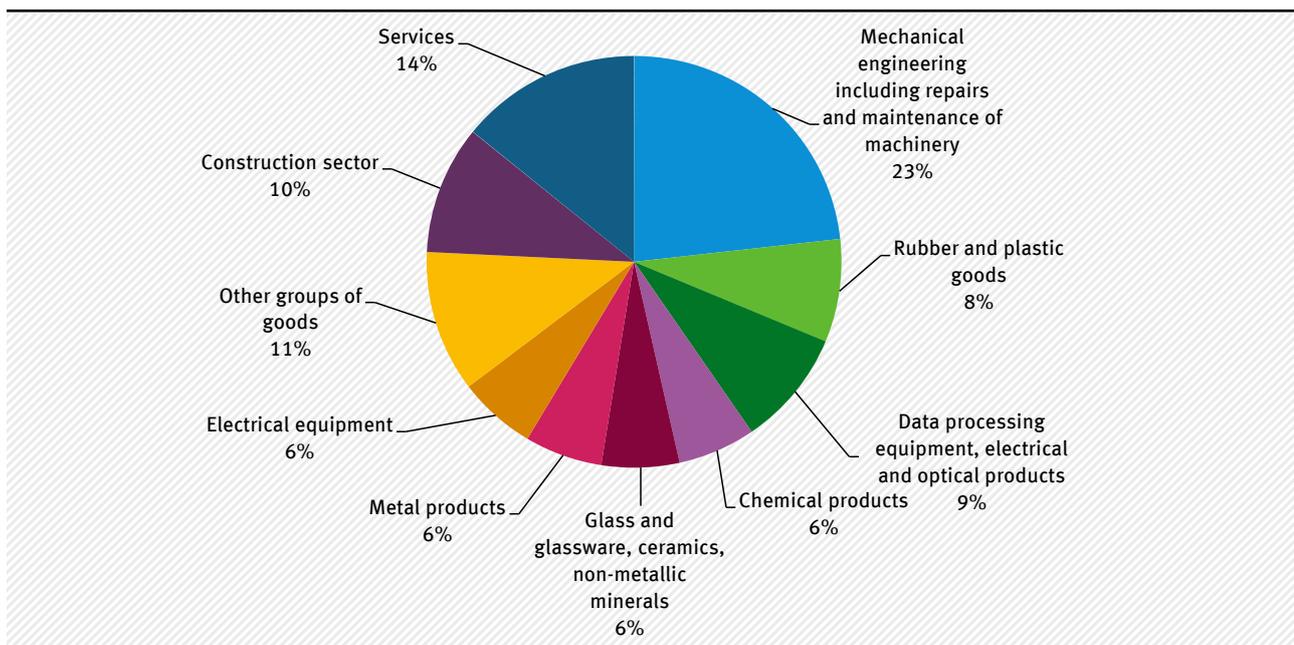
The sales figures for companies that class themselves as belonging to the environmental economy also include constructional and other services for protection of the environment. Thus the survey of goods, construction work and services for environmental protection forms a third important pillar for describing the German environmental economy. They confirm and supplement the analyses of production and foreign trade potential<sup>v</sup>. Like the production of potential environmental protection goods, total sales of environmental protection goods and services also fell in

2012<sup>vi</sup>, namely by 8% compared with the year before. This can also be attributed to the climate protection sector (-12%), and especially to photovoltaic systems (-34%). In spite of the sharp decline in sales, companies still made 65% of their environmental protection sales in the climate segment.

With a figure of 75%, industrial companies in the manufacturing sector generated by far the largest share of sales of environmental protection goods and services; the construction sector accounted for 10% and the services sector for 14% (cf. Fig. 6).

Fig. 6:

### Sales shares of goods, construction work and services for environmental protection in 2012



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 85

### Empirical basis: “Survey of goods, construction work and services for environmental protection”

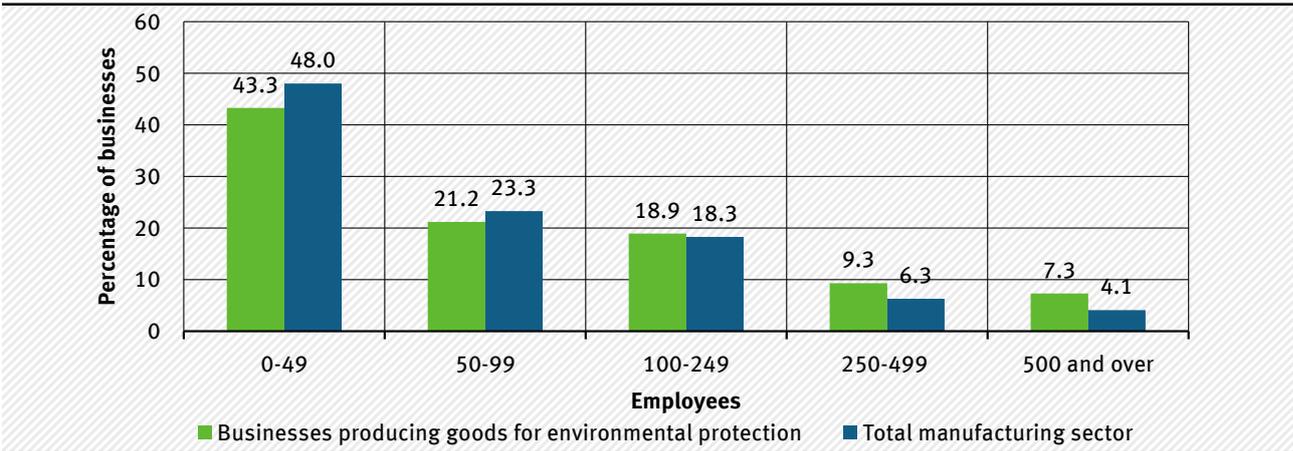
In Germany, collection of statistics on the environmental economy is largely based on the survey of goods, construction work and services for environmental protection. Since 1997 the Federal Statistical Office has performed this annual survey of companies. It provides information on the scale and structure of the environmental protection goods and services supplied in Germany. Since 2006 it has also included the fields of renewable energy sources, energy saving, and prevention/reduction of climate-relevant emissions. Moreover, the circle covered by the report has been considerably expanded in recent years. Activities are currently in progress at European level to establish comparable international statistics on the “Environmental goods and services sector (EGSS)”. In 2011 the adaptation to relevant EU requirements resulted in further revision of the circle covered by the report. This limits the possibility of comparison with results from previous years.

The environmental economy is dominated by small and medium enterprises. Approximately 94% of all companies supplying goods, construction works or services for environmental protection had fewer than 250 employees in 2012, and 69% actually had fewer than 50 employees. However, the importance of small and medium enterprises is not greater than in industry as a whole. For example, the share of small and medium enterprises (up to 250 employees) producing environmental protection goods is, at 83%, relatively lower than the 90% for the manufacturing sector as a whole<sup>vii</sup> (cf. Fig. 7). Much the same is true of the construction and services sectors.

A glance at the distribution of sales puts the importance of SMEs for the environmental economy into perspective: although companies with fewer than 250 employees account for a total of 94% of all environmental protection businesses, their combined share of sales comes to only 40%. Large companies with over 500 employees achieve a similar share (44%), but represent only a good 2% of all environmental businesses. The decisive factor responsible for this distribution of sales is the manufacturing sector, where more than half of all sales of environmental protection goods are made by companies with 500 or more employees (cf. Fig. 8).

Fig. 7:

**Distribution of companies by number of employees, 2012**



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 91

Fig. 8:

**Distribution of sales by number of employees, 2012**



Source: own diagram (UBA), after Gehrke and Schasse (2015a), p. 92

## 6 Conclusions and prospects

The results show the great economic significance of environmental protection. In 2013, German industry exported environmental protection goods worth €82 billion. Germany is also extremely competitive in the field of international trade in environmental protection goods. This is shown not only by its world trade share of 14.8%, but also by the fact that the German environmental protection industry enjoys a good position in all regions of the world and in all environmental sectors.

There continues to be a need for major worldwide increases in environmental protection efforts. This applies not only to climate change mitigation, but also to all other environmental sectors, for example water conservation and wastewater treatment, waste management, air quality control or noise abatement. Global megatrends such as population growth, dwindling resources, urbanisation and industrialisation of the emerging economies will further increase the need for action in the decades ahead.

A “business as usual” strategy does not address these challenges and is not a solution. International conventions such as the Paris Climate Convention and the 2030 Agenda for Sustainable Development are already providing a significant impetus. The need to push ahead with environmental protection is increasing the demand for environmental protection goods and technologies. This makes environmental protection and climate change mitigation all the more important for industry. Countries that have specialised in the production of environmental protection goods and technologies are in a position to benefit from this trend. There are great economic opportunities for Germany in view of its excellent competitive position.

Many countries have recognised the potential of the environmental economy and are forging ahead with appropriate development strategies. There is therefore reason to expect a further increase in the intensity of competition on the international markets. In order to secure Germany’s technical pioneering role and its comparative advantages, there is thus a need for further efforts in the field of research and development and also innovations.

Environmental policy is also an important driving force behind innovation, as the past has already shown. One reason why the German environmental economy enjoys such a good position on the world market is the fact that it had to implement high environmental standards at an early stage. A progressive and innovation-oriented environmental policy is therefore of crucial importance to safeguarding the competitiveness of the German environmental economy in the long term. This includes promoting environmental innovations throughout all innovation phases, and eliminating all distortions of competition that take place at the expense of eco-friendly products and production processes. Another important factor is that environmental policy should set ambitious long-term objectives and thereby create a climate of certainty for investors.

## End notes

- i For this reason the Federal Environment Ministry and the Federal Environment Agency regularly award research projects aimed at analysing the size, composition and competitiveness of the environmental economy. These take a variety of statistical approaches to acquiring data on the environmental economy, thereby casting light on its many and various facets.
- ii For the sake of simplicity, the following remarks mostly refer to environmental and climate protection goods, even where the basis is the potential approach.
- iii Potential environmental protection goods comprise goods in the field of waste, water, air, noise, measurement and control technology and climate protection goods. A country's share of world trade is calculated on the basis of its percentage of world exports. World exports are calculated from the exports of the OECD countries and China, including Hong Kong, plus the imports from the groups of countries not mentioned. World exports 2013, estimated.
- iv The RCA ("Revealed Comparative Advantage") determines the specialisation advantages of an economy by comparing export supply with import demand for certain product groups. A positive RCA indicates comparative advantages and hence a strong international competitive position of the product group in question in the country concerned. The corresponding export surpluses are relatively greater than is the case for industrial goods in general in that country.
- v However, since the two analyses are based on totally different study concepts and definitions, direct comparison of the values obtained is not possible.
- vi On the basis of the survey of goods, construction work and services for environmental protection, no data are yet available for 2013 at the time of reporting (unlike the case of potential environmental protection goods).
- vii Since nearly all suppliers of goods for environmental protection are in the manufacturing sector, it is permissible to compare the employee size structure of the goods-producing environmental economy with that of the manufacturing sector as a whole.

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