German Institute
for Economic Research

No. 20/2009
Volume 5
September 3, 2009

DIW BERLIN

Weekly Report

Global Demand for Environmental Goods and Services on the Rise: Good Growth Opportunities for German Suppliers

According to conservative calculations, over $580 billion was spent worldwide on environmental goods and services and renewable energy technologies[1] in 2004. So-called "green spending" is set for strong growth in the future on account of the long-term expansion of the global economy and mounting environmental challenges. Significant opportunities for growth and employment in Germany are also offered by forecasted trends in the market for green technologies.

DIW Berlin has developed a method to quantify future global demand for environmental goods and services based on alternative economic scenarios. The method places a key focus on the international trade of environmental goods and services. Our calculations predict that the effective annual demand for environmental goods and services in Germany will increase from $75 billion in 2004 to between $106 and 171 billion by 2020 (at 2004 prices and exchange rates). The high growth in German exports is responsible in particular for this trend. Nevertheless, sensitivity calculations indicate that demand could also grow at a much slower rate through 2020 under unfavorable economic conditions.

Severe environmental challenges are associated with the projected long-term global growth. In the industrialized world, significant political hurdles remain in the area of environmental and climate protection. At the same time, environmental problems are intensifying in developing and emerging nations. While behavioral changes are imperative in order to address these challenges, environmental protection technologies will nevertheless play an essential role. Markets of the future in green technologies will provide substantial opportunities for growth and employment in technologically advanced and export-oriented countries such as Germany.

When evaluating the structural transformation of the global market for green technologies, it is necessary to take supply- and demand-side effects into account. In a supply-side study, selected fields of activity in environmental protection were described based on technological indicators and company surveys.[2] In this recent study conducted by DIW Berlin, this supply-side perspective was supplemented with an analysis of potential future global demand for environmental goods and services

1 In this report these goods will be refered to as environmental goods and services.

2 Cf. German Institute for Economic Research (DIW Berlin), Fraunhofer Institute for Systems and Innovation Research (FhG-ISI), Roland Berger Strategy Consultants: Wirtschaftsfaktor Umweltschutz: Vertiefende Analyse zum Thema Umweltschutz und Innovationen, Umwelt, Innovation, Beschäftigung 01/07. Ed. BMU, UBA, Dessau 2007.

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JEL Classification:
Q56, Q27, F18

Keywords:
Environmental Goods and Services Sector, World Trade, Scenarios.

Box 1

Methodological Principles

The study is based on the strict classification of environmental goods and services used by Eurostat and the OECD.[1] The use of this classification is advantageous in that permits the analysis of a number of internationally comparable datasets from various countries. However, these data do not take shifting environmental priorities and technological change in environmental protection fully into account. Estimates are made in three steps (Figure):

- Determination of the size of the world market in terms of global expenditures on environmental goods and services
- Determination of the volume of world trade in environmental goods and services
- Determination of the volume of German exports based on the percentage of goods imported from German

Future spending by individual countries on environmental protection is estimated based on their level of development, as measured in terms of per capita GDP.

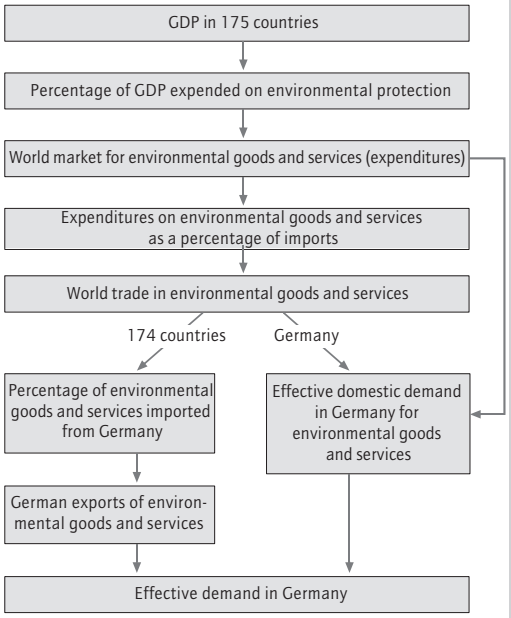
The imports of environmental goods and services are estimated on the basis of general trade relationships. Effective domestic demand is determined in each case based on the difference between expenditures and imports. The overall effective domestic demand also depends on export demand. Germany's market share in other countries' imports can be estimated for the past by evaluating trade flows in "potential environmental goods and services."

GDP growth forecasts for 175 countries serve as the basis for calculations under each scenario with regard to "traditional" environmental protection sectors.[2] In these GDP forecasts, fluctuations in prices and exchange rates are ignored; all results are understood in real terms at 2004 prices and exchange rates. The assumptions concerning the average rates of real growth through 2020 are based on the convergence hypothesis, whereby poorer countries are generally able to grow faster than richer ones; model-based projections made by various international organizations and research institutes validate these assumptions.[3]

Figures on spending for environmental protection as a percentage of GDP in Europe and some other countries were taken from Eurostat and the OECD. For countries where primary data was lacking, environmental protection spending as a percentage of GDP was estimated based on each respective country's overall level of economic development.

Figure

Methodological Approach



Source: DIW Berlin calculations. **DIW** Berlin 2009

Important aspects of climate protection expenditures—such as investments in renewable energy—are not contained in the Eurostat and OECD statistics. The estimation of global expenditures on renewable energy systems is therefore based on a study commissioned by the German Federal Environment Ministry (BMU) in which various global development paths were developed.[4] Country-specific estimates of investment in renewable energy as a percentage of GDP were estimated based on this study.

In order to estimate the share of environmental goods and services imported from abroad, an import rate was determined on a country-by-country basis starting with the overall national import rate while taking into account the limited tradability of environmental goods and services. The Niedersächsische Institut für Wirtschaftsforschung ("Lower Saxony Institute for Economic Research") undertook an evaluation of the OECD's foreign trade statistics on behalf of DIW Berlin in order to determine the export shares in environmental goods and services attributable to a selection of OECD countries.

1 Cf. Statistical Office of the European Communities (Eurostat): SERIEE Environmental Protection Expenditures Accounts – Compilation Guide. Luxemburg 2002; Eurostat: Classification of Environmental Protections Activities and Expenditure (CEPA 2000) with explanations. Luxemburg 2002.

2 Scenarios demonstrate possible future developments. The essential feature of scenarios is that they are consistently derived from a set of assumptions and their consequences are demonstrated.

3 Cf. Blazejczak, J., D. Edler, l.c., chapter 4.

4 ZSW, DIW, DLR, GWS 2006: Wirkungen des Ausbaus der Erneuerbaren Energien auf den deutschen Arbeitsmarkt unter besonderer Berücksichtigung des Außenhandels. Study undertaken on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Berlin 2006.

Box 2

Terms Used

Environmental Protection Expenditures

Environmental protection expenditures designates all spending by industry, the public sector and specialized producers for targeted environmental protection measures, i.e. for direct avoidance, abatement or elimination of pollution or other environmental impacts. It is subdivided according to the following purposes:

- Air: Air pollution control and climate protection
- Wastewater: Reduction of emissions into water, wastewater management
- Waste: Collection, treatment and avoidance of waste
- Other (non-core activities): Soil and ground water protection, noise protection, protection of biodiversity and landscape conservation, radiation protection, research and development, general administration and multifunctional measures

Potential Environmental Goods and Services

Goods relevant to environmental protection but which can also be used for other purposes (dual-use).

Environmental Goods and Services

Environmental goods and services include investment goods as well as raw, auxiliary and operating materials and services for environmental protection.

World Market for Environmental Goods and Services

The world market for environmental goods and services encompasses the demand from all countries for environmental goods and services, irrespective of whether this demand is met by domestic products or by imports.

World Trade in Environmental Goods and Services

World trade with environmental goods and services corresponds to all countries' imports and exports of environmental goods and services.

Effective Domestic Demand for Environmental Goods and Services

The effective domestic demand for environmental goods and services is derived from domestic demand (expenditures) minus imports plus exports. It ultimately determines the amount of value added produced in Germany.

in order to arrive at an overall market assessment.[3] For the purpose of this study, DIW Berlin developed a method that enables the quantitative forecasting of effective demand for environmental goods and services (Box 1 and 2).

In this connection, a key focus is the assessment of export opportunities for German industry in the fields of "traditional" environmental protection and renewable energy technologies.

In order to account for uncertainties in global expenditure on environmental goods and services, two scenarios are considered for the period through 2020. The "Low Environmental Protection Expenditures" scenario assumes 1.5% of GDP will be spent on environmental protection in high-income countries (measured in terms of per capita GDP). This scenario also assumes a rather moderate rate of investment growth in renewable energy through 2020. In the "High Environmental Protection Expenditures" scenario, it is assumed that environmental protection expenditures will amount to 1.5% of GDP in poor countries and 2.5% of GDP in rich countries, whereby zero expenditures are assumed for very poor countries. In this scenario, investment in renewable energy is predicted to grow more vigorously: to $315 billion per annum in 2020, in contrast to $145 billion in the first scenario. Germany's respective share of world trade in various environmental fields in 2004 is carried forward in both scenarios to 2020.

Key data for the world market in environmental goods and services are displayed for the scenarios described above in Table 1 and Figure 1.

Dynamic Growth in the World Market and World Trade

In 2004 (the baseline year for the study) $584 billion were spent worldwide on environmental goods and services. Europe accounted for almost 50% of this spending, while North America and Asia each accounted for 25%. Spending in the rest of the world was largely insignificant.

3 Cf. Blazejczak, J., D. Edler: "Szenarien zur Entwicklung des Weltmarktes für Umwelt- und Klimaschutzgüter." A research project commissioned by the German Federal Environment Ministry (grant code 204 14 107), Umwelt, Innovation, Beschäftigung 04/08. Ed. BMU, UBA, Dessau 2008.

Table 1

World Market for Environmental Goods and Services[1] by Region

Average annual percentage rate of change from 2004 to 2020

	GDP	Expenditures		Imports (import region)		German exports (target regions)	
		High	Low	High	Low	High	Low
Europe	2.5	5.4	2.1	6.5	3.0	7.7	4.2
North America	3.3	9.9	6.3	11.5	8.0	12.0	8.8
Asia	4.8	8.3	6.0	12.2	9.7	12.3	9.7
Rest of the world	3.8	9.0	7.0	10.7	8.7	11.5	8.9
World as a whole	**3.5**	**7.7**	**4.7**	**9.4**	**6.4**	**9.4**	**6.3**

1 US dollars at 2004 prices and exchange rates.

Source: DIW Berlin calculations. **DIW** Berlin 2009

In our calculations, the global economy is assumed to grow at an average annual rate of 3.5% between 2004 and 2020. Alternate growth rates are presupposed for each region, however: Europe is predicted to have slowest growth, at 2.5%, while Asia has the fastest, at 4.8%. Expenditures on environmental goods and services increase appreciably under these growth conditions. In the "Low Environmental Protection Expenditures" scenario, spending increases annually at a rate of 4.7% to around $1.2 trillion by 2020; in the "High Environmental Protection Expenditures" scenario, a 7.7% annually growth rate leads to global expenditures of $1.9 trillion by 2020. In both scenarios, the regional share of spending increases significantly in Asia and North America while falling in Europe.

As a result of an increasing international division of labor, the international market for environmental goods and services is predicted to grow faster than the global economy. In the "High Environmental Protection Expenditures" scenario, world trade grows at an annual average of 9.4%, almost three times faster than the world economy; even in the "Low Environmental Protection Expenditures" scenario, world trade grows twice as fast as the global economy, at an average rate of 6.4% per annum.

Import growth in Asia is particularly high in both scenarios. As highly competitive export-oriented industrial country, Germany profits from this growth trend.

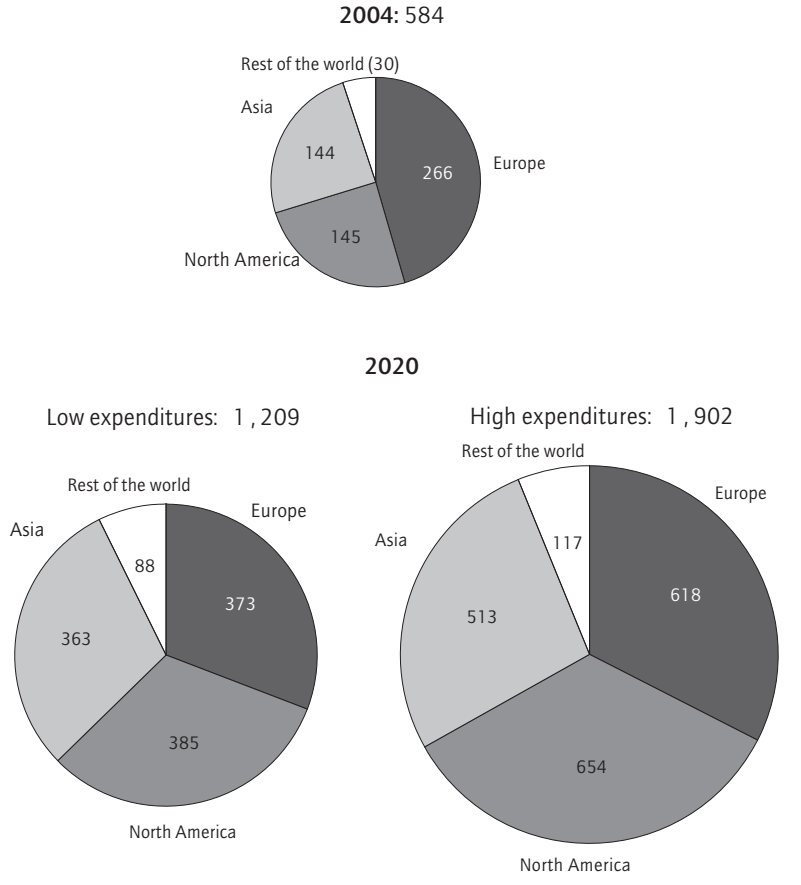
A Positive Outlook for Germany

The current and future demand experienced by German suppliers of environmental goods and services depends not only on Germany's domestic market, but also—and to an increasing extent—on export opportunities (Table 2). The effective demand for environmental goods and services in Germany is estimated at $73.5 billion for the baseline year of 2004. This figure is the sum of German domestic spending ($63.6 billion) and exports ($24.3 billion) minus imports ($14.4 billion).

Figure 1

Global Expenditures on Environmental Goods and Services by Region

In $ billions[1]



1 At 2004 prices and exchange rates.

Source: DIW Berlin calculations. **DIW** Berlin 2009

Table 2

Demand for Environmental Goods and Services in Germany

	2004	Expenditures in 2020	
		High	Low
In $ billions1			
Expenditures on environmental goods and services	63.6	96.9	58.5
minus imports	14.4	28.1	17.1
plus exports	24.3	102.5	64.3
Effective demand in Germany	73.5	171.3	105.7
Average annual percentage rate of change from 2004 to 2020			
Expenditures on environmental goods and services	–	2.7	–0.5
minus imports	–	4.3	1.1
plus exports	–	9.4	6.3
Effective demand in Germany	–	5.4	2.3

1 At 2004 prices and exchange rates.

Source: DIW Berlin calculations. **DIW** Berlin 2009

… under the "Low Environmental Protection Expenditures" Scenario

In this scenario, annual expenditures on environmental goods and services in Germany fall by approximately $5 billion between 2004 and 2020 to $58.5 billion. Over the same period, however, Germany's annual exports grow to $64.3 billion (6.3% annual growth). The total effective demand in Germany for environmental goods and services is estimated for 2020 at $105.7 billion.[4] The overall increase of $32.2 billion is export-driven in this scenario; nevertheless, the annual rate of demand growth (2.3%) is significantly higher than overall German GDP growth (1.4%) (see Figure 2).

… under the "High Environmental Protection Expenditures" Scenario

In a scenario in which worldwide spending on environmental goods and services significantly increases, spending in Germany also rises strongly. Given moderate growth in expenditures on environmental goods and services until 2020 (2.5% GDP), as well as a moderate rise in the volume of investment in renewable energy, total expenditures increase in Germany to $96.9 billion. This corresponds to a real annual growth rate of 2.7%. Imports of environmental goods and services also roughly double in this case. This is a reflection of increasing international integration.

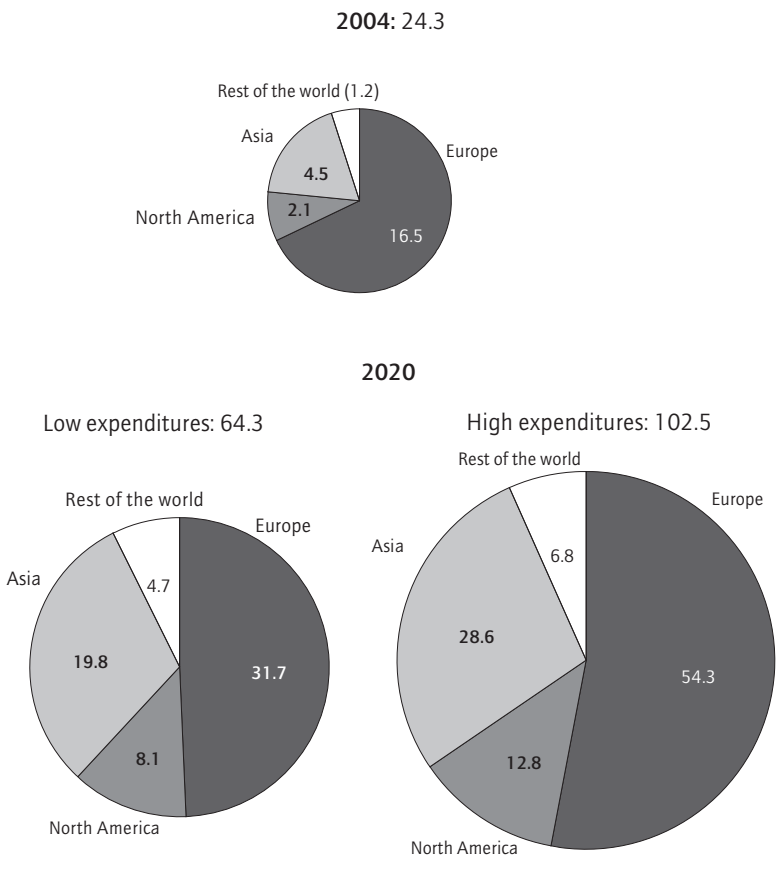
Due to the stronger increase in the percentage of GDP expended on environmental goods and services in other countries, German exports grow even stronger, rising fourfold to $102.5 billion by 2020. The effective demand for environmental goods and services in Germany is estimated at $171.3 billion

4 In this scenario, imports grow by 1.1% annually to $ 17.1 billion.

Figure 2

German Exports of Environmental Goods and Services by Region

In $ billions[1]



1 At 2004 prices and exchange rates.

Source: DIW Berlin calculations. **DIW** Berlin 2009

in this scenario, which corresponds to an annual increase of 5.4%. The growth outlook for the environmental industry thus far outstrips the growth anticipated for the German economy on the whole. In this way, German suppliers of environmental goods and services will emerge as winners in the economic transformation of coming years.

Sensitivity Analyses

Based on certain assumptions, there may also be a markedly lower rise in German exports of environmental goods and services. An even more pronounced shift in world growth from Europe to Asia would only have a small impact on the international market and growth in world trade for environmental goods and services. Growth in demand for German environmental goods and services would be slower, however, as German environmental goods and services make up a greater share of imports in European countries than they do in Asian ones.

As globalization continues, foreign suppliers of environmental technology will increasingly seek opportunities in international markets. This could mean a decline in Germany's share of the world market for environmental goods and services. If Germany's market share in all environmental sectors and sales regions were to drop by one percentage point, the average annual rate of growth in German exports of environmental goods and services would decline by almost half a percentage point through 2020.

The significance of individual markets is demonstrated by a sensitivity calculation in which one assumes that US spending on environmental goods and services only increases to 1.5% instead of 2.5% of GDP. Similar consequences for German exports are witnessed when the US GDP growth forecast is revised downwards to 2% from 3%.

The growth in demand for German environmental goods and services will be largely export-driven. A slowdown in the pace of globalization would noticeably decrease German production in environmental goods. Other European countries would have less significance as export markets for German environmental technology, whereas the Asian and North American markets would gain in importance. Nevertheless, the use of plausible input variables indicates that exports to other European countries will still account for half of all of Germany's exports in environmental goods and services in 2020.

Even if Germany's market share in selected regions and sectors gradually declines, thanks to its pioneering role in the development of renewable energy technologies, it is positioned to profit considerably over the long term from the anticipated growth in worldwide expansion in renewables, provided that German companies succeed in maintaining their current good competitive position in world markets and the global deployment of renewable energy continues.

Conclusion

Global expenditures on environmental goods and services will rise considerably in coming years. The scenarios discussed in this study identify a plausible range of global growth in environmental goods and services. According to our calculations, global spending at 2004 prices and exchange rates will rise from $584 billion in 2004 to $1,209 billion in 2020 (under the "Low Environmental Protection Expenditures" scenario) or to $1,902 billion (under the "High Environmental Protection Expenditures" scenario). German suppliers stand to profit from the export opportunities presented by this growth.

In the scenario with low worldwide growth in expenditures for environmental goods and services and with conservative global growth in renewable energy, the effective demand in Germany increases to $105.7 billion in 2020 (equivalent to 2.3% annual growth). A 6.3% annual rate of growth in exports is the clear driver of this demand trend.

In the scenario with high worldwide growth in spending on environmental goods and renewable energy, Germany experiences a significantly higher demand for environmental goods and services of $171.3 billion in 2020 (equivalent to 5.4% annual growth). German export growth is forecasted as particularly robust at 9.4% per annum.

(First published as "Weltweite Nachfrage nach Umwelt- und Klimaschutzgütern steigt: Gute Wachstumschancen für deutsche Anbieter", in: Wochenbericht des DIW Berlin Nr. 18/2009)

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ISSN 1860-3343
Price: Euro 10.–
www.diw.de/english/produkte/publikationen/weeklyreport
Translated from the German.