

Report

Project title: **3Rs Study**

Client: **Federal Ministry for the Environment,
Nature Conservation and Reactor
Safety**

Project No.: **410524**

Authors: **Bernhard Gerstmayr
Markus Hertel
Hansjürgen Krist
Stefanie Müller
Dr. Dieter Tronecker**

Augsburg, 18 April 2011

TABLE OF CONTENTS

LIST OF FIGURES	V
LIST OF TABLES	V
LIST OF ABBREVIATIONS	VI
1 Cause and Approach	1
2 Goal 1 "Prioritize 3Rs Policies and Improve Resource Productivity"	1
2.1 Action 1-1 "Prioritise Implementation of 3Rs Policy"	1
2.1.1 Five-stage Waste Hierarchy and Minimum Recycling Quotas	2
2.1.2 Establishment of Waste Avoidance in Legislation	2
2.1.3 Expansion of Separate Biowaste Collection.....	5
2.1.4 Promotion of Reusable Beverage Packaging and Ecologically Advantageous One-way Beverage Packaging	5
2.2 Action 1-2 "Improve Resource Productivity"	6
2.2.1 Federal Government's Sustainability Strategy	6
2.2.2 "Material Efficiency and Resource Conservation Research Project (MaResS)".....	7
2.2.3 German Material Efficiency Agency (demea).....	7
2.2.4 Centre for Resource Efficiency (ZRE)	8
2.2.5 Contribution of Waste Recycling to Improving Resource Productivity.....	8
2.2.6 Chemical Leasing	9
2.3 Action 1-3 "Pursue Co-benefits between the 3Rs and Greenhouse Gas Emission Reductions"	10
2.3.1 Principles of Landfill and the Landfill Ban on Untreated Waste.....	10
2.3.2 Reduction of Greenhouse Gases by the Transformation of the Waste Sector.....	11
2.3.3 Waste for Energy Recovery.....	12
2.4 Action 1-4 "Technical Innovation and Environmental Design"	13
2.4.1 EU Eco-design Directive.....	13
2.4.2 Green Public Sector Procurement.....	14

2.4.3	Environmental Innovation Programme	15
2.4.4	German Federal Foundation for the Environment	16
2.4.5	Innovation Funding by the r ² and r ³ Programmes.....	16
3	Goal 2 "Establishment of an International Sound Material-Cycle Society"	17
3.1	Action 2-1 "Collaborate to Promote Sound International Resource Circulation"	17
3.1.1	International Obligations on the Part of Germany Relating to Cross-border Transfer of Waste and Their Implementation	17
3.1.2	The Basel Convention and Development of Waste Exports from Germany.....	18
3.1.3	Controls on the Prevention of Illegal Transport and Sham Recovery of Waste	19
3.1.4	Regulations on Waste Electrical and Electronic Equipment in the EU and Germany.....	19
3.1.5	Stockholm Convention.....	20
3.1.6	Legal Regulations on Recovery of End of Life Vehicles.....	21
3.2	Action 2-2 "Trade of Products and Goods and Transboundary Waste Shipment"	22
3.2.1	Distinction Between Waste and Non-waste.....	22
3.2.2	Imports and Exports of Waste and Secondary Raw Materials	24
4	Goal 3 "Collaborate for 3Rs Capacity Development in Developing Countries"	26
4.1	Action 3-1 "Cooperation with Developing Countries"	26
4.1.1	Bilateral and Multilateral Cooperation.....	26
4.1.2	CDM /JI Initiative	27
4.2	Action 3-2 "Promote Technology Transfer and Environmental Education"	28
4.2.1	Federal Ministry for the Environment's Advisory Assistance Programme	28
4.2.2	RETech Initiative	28
4.2.3	Cleaner Production Germany.....	29
4.2.4	Environmental Technology Atlas	29

4.2.5	Twinning Projects	29
4.3	Action 3-3 " Cooperation with Stakeholders"	30
4.3.1	Environmental Information Act	30
4.3.2	German Environmental Information Portal	31
5	Summary and Outlook	31

LIST OF FIGURES

Figure 1:	Development of the consumption of quoted packaging, total volume of packaging and the real gross domestic product during the period from 1991 to 2007; sources: Gesellschaft für Verpackungsmarktforschung (GVM) and Federal Office for Statistics (2009).....	3
Figure 2:	Decoupling of the volume of waste from economic output, waste intensity; source: Federal Environment Agency based on data of Federal Office for Statistics	4
Figure 3:	Multi-barrier concept for landfill sites.....	10
Figure 4:	Climate protection potential of the waste management industry in Germany; source: IFEU – Institute for Energy and Environmental Research, Öko-Institut (2010),	12
Figure 5:	End of life vehicle recovery quotas in Germany from 2004 to 2008; Source: Federal Environment Agency.....	22

LIST OF TABLES

Table 1:	Timeline of export volume of waste arising in Germany and requiring notification control since 1998 in 1,000 t; Source: Federal Environment Agency	18
Table 2:	Timeline showing import and export volumes of waste not requiring compulsory notification since 1998 in 1,000 t; Source: Federal Environment Agency	24
Table 3:	Timeline showing import and export volumes of waste requiring compulsory notification since 1998 in 1,000 t; Source: Federal Environment Agency	24

LIST OF ABBREVIATIONS

AbfRRL	EU Waste Framework Directive
BAW	biologically degradable materials
BMBF	Federal Ministry of Education and Research
BMU	Federal Ministry for the Environment, Nature Conservation and Reactor Safety
BMZ	Federal Ministry for Economic Cooperation and Development
CDM	Clean Development Mechanism
CHP	combined heat and power plants
CPG	Cleaner Production Germany
3R	Reduce, Reuse, Recycle
Ewgv	One-way beverage packaging
KfW	Credit Bank for Development
KrW-/AbfG	Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal
KrWG	Act for Promoting Closed Substance Cycle Waste Management (amendment of the KrW-/AbfG)
KrWG, draft	Draft Act for Promoting Closed Substance Cycle Waste Management, adopted by Federal Cabinet on 30.3.2011
KWK	Combined Heat and Power
Möve	Reusable and ecologically advantageous one-way beverage packaging
Mwgv	Reusable beverage packaging
NAMA	National Appropriate Mitigation Action
RETech	Export Initiative Recycling and Efficiency Technologies - initiative of the Federal Ministry for the Environment, Nature Conservation and Reactor Safety (RETech Initiative)
UBA	Federal Environment Agency
UNFCCC	United Nations Framework Convention on Climate Change

1 Cause and Approach

The focus of this project is a report to the G8 states describing developments in Germany within the nine "Actions" of the "*Kobe 3R Action Plan*" during the period from 2008 to 2010. The purpose of this report is to inform the G8 states about progress in the Federal Republic of Germany towards achieving the goals formulated in the 3R Initiative.

The *Kobe 3R Action Plan* defines criteria and provisions for the operationalisation of the nine Actions; these essentially complement each other and in parts overlap jointly. In accordance with the agreements reached in 2008, the G8 states must report in 2011 on the progress and success of the individual measures they have implemented.

This report summarises the implementation status in Germany and discusses in particular the measures taken since 2008. The structure of this report is based on the *nine Actions*, which, in turn, are correlated to the *three Goals* of the *Kobe 3R Action Plan*.

2 Goal 1 "Prioritize 3Rs Policies and Improve Resource Productivity"

Goal 1 emphasises the importance of the principles of 3R for improving resource productivity and reducing greenhouse gases. Improved financing of research and development efforts is regarded as essential to achieve improvements in these fields.

Germany recognised at a very early stage that natural resources can only be conserved by a consistent commitment to recycling management. In the past decades, Germany has put in place a legal framework extending across all sectors that has led to a rethinking away from the *end-of-the-pipe* principle and towards a secondary raw material economy. The report discusses central elements of this far-sighted policy below, with the focus largely being on developments since 2008.

2.1 Action 1-1 "Prioritise Implementation of 3Rs Policy"

The legislature in Germany will meet key requirements of the *Kobe 3R Action Plan* in the course of the ongoing implementation of the *EU Waste Framework Directive* into national law.

The *EU Waste Framework Directive 2008/98/EC (AbfRRL)* published in 2008 in the Official Journal of the European Union (OJEU) replaces the existing *Waste Framework Directive 2006/12/EG*¹. National implementation of this Directive will be by means of the *Draft Act for*

¹ The original Regulation 75/442/EEC from the European Council on 15 July 1975 on waste has been amended several times and on key points; it was finally replaced in 2006 by Regulation 2006/12/EC. Two years later the Regulation 2006/12/EC was amended; the amended version is the EC Waste Framework Directive 2008/98/EC dated 19.11.2008, which became law on 12.12.2008. The Directive comprises 43 Articles (Art.) and 5 Appendices.

Promoting Closed Substance Cycle Waste Management (KrWG, draft) published on 30.11.2010 and should be in 2011. The *Draft Act for Promoting Closed Substance Cycle Waste Management* includes the parent acts for implementation of new single directives and the further development of existing single directives for the implementation of the objectives of the Act.

2.1.1 Five-stage Waste Hierarchy and Minimum Recycling Quotas

The *EU Waste Framework Directive* ushers in a new five-stage waste hierarchy into European waste legislation (Art. 4) and makes a differentiation between prevention, preparation for reuse, recovery of materials (recycling), other recovery, such as energy recovery and disposal of waste. According to Art. 4 Clause 2 of the *EU Waste Framework Directive*, member states have to take the necessary "measures to promote the options that, as a whole, achieve the best result in terms of environmental protection." This could necessitate "certain waste streams deviating from the waste hierarchy, providing that this is justified when considering the life cycle in relation to the overall effects of generation and management of this."

The Federal Ministry for the Environment, Nature Conservation and Reactor Safety (BMU), hereinafter referred to as the Federal Ministry for the Environment, interprets the waste hierarchy as a "guiding principle" with the justification that the hierarchy is not an end in itself, but rather a tool for the selection and promotion of the best option for the environment.

The *Draft Act for Promoting Closed Substance Cycle Waste Management* provides for improved utilisation of resources by the introduction of ambitious recycling and recovery quotas that go beyond the requirements of the *EU Waste Framework Directive*. From 2020, at least 65 % of all municipal solid waste is to be recycled² and at least 70 % of all building and demolition waste is to be recycled³ or the material recovered. The draft bill also creates the legal principles for the extended separate collection of recyclables from what has to date been residual waste, to utilise the potential resources of recyclable waste from private households more effectively.

2.1.2 Establishment of Waste Avoidance in Legislation

The five-stage waste hierarchy of the *EU Waste Framework Directive* promotes intensified waste avoidance and recycling efforts on the part of the EU member states. Waste avoidance, as the paramount goal of modern waste policies, is to be supported and promoted by public sector waste avoidance programmes, among other instruments.

According to Art. 29 (combined with Art. 9 and Appendix IV) of the *Waste Framework Directive*, when implementing the *Directive* into national legislation, EU member states have an obligation to put in place waste avoidance programmes by 2013. These programmes should stipulate waste avoidance targets and define appropriate practicable waste avoidance measures with the involvement of relevant stakeholders, local authorities and the

² The minimum recycling quota also includes preparing for reuse.

³ *ibid*

wider public. To this end, the Federal Ministry for the Environment, along with the Federal Environment Agency, has commissioned research institutions to produce an inventory and description, as well as an assessment, of existing avoidance measures in accordance with the definitions of the *Waste Framework Directive*.

Art. 29 Clause 3 of the *Waste Framework Directive* literally demands that the member states must specify "practicable, specific qualitative or quantitative benchmarks for waste avoidance measures adopted" by means of which "the progress achieved by means of these measures can be monitored and assessed." In Germany particular focus has been directed at the possibility of extended producer responsibility. Germany can look back on a number of years of experience and success with this eco-political tool; following the introduction in 1997 of the *Packaging Ordinance*, based on producer responsibility, the specific consumption of packaging per head of population in Germany was decoupled from the (real) gross domestic product. This decoupling was particularly significant among the types of packaging for which minimum recycling quotas were specified in the *Packaging Ordinance* (so-called "quoted packaging", cf. Figure 1).

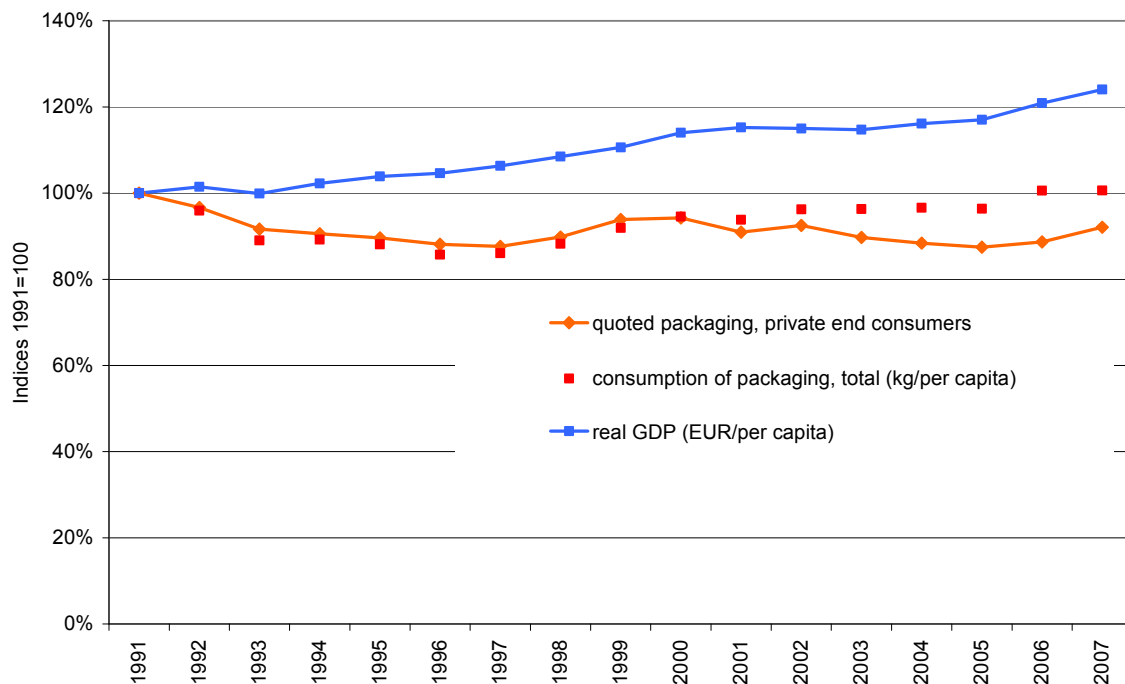


Figure 1: Development of the consumption of quoted packaging, total volume of packaging and the real gross domestic product during the period from 1991 to 2007; sources: Gesellschaft für Verpackungsmarktforschung (GVM) and Federal Office for Statistics (2009)

Considerable importance is attached to the creation of closed material cycles as part of a sustained policy of conservation of material resources. In German legislation priority is given to the maximum possible degree of utilisation of materials extracted from nature to avoid the production of waste at source.

The legislation aims to decouple the volume of waste from economic growth. This will be deemed to have been achieved when the volume of waste line no longer follows the economic growth line and is characterised by a negative trend in waste intensity. Waste intensity is used to measure sustainability and is – with limitations, as there are also other influences, such as a reduction in the vertical range of manufacture – an indicator showing how resource-conserving the generation of economic output is.

Index 2000 = 100

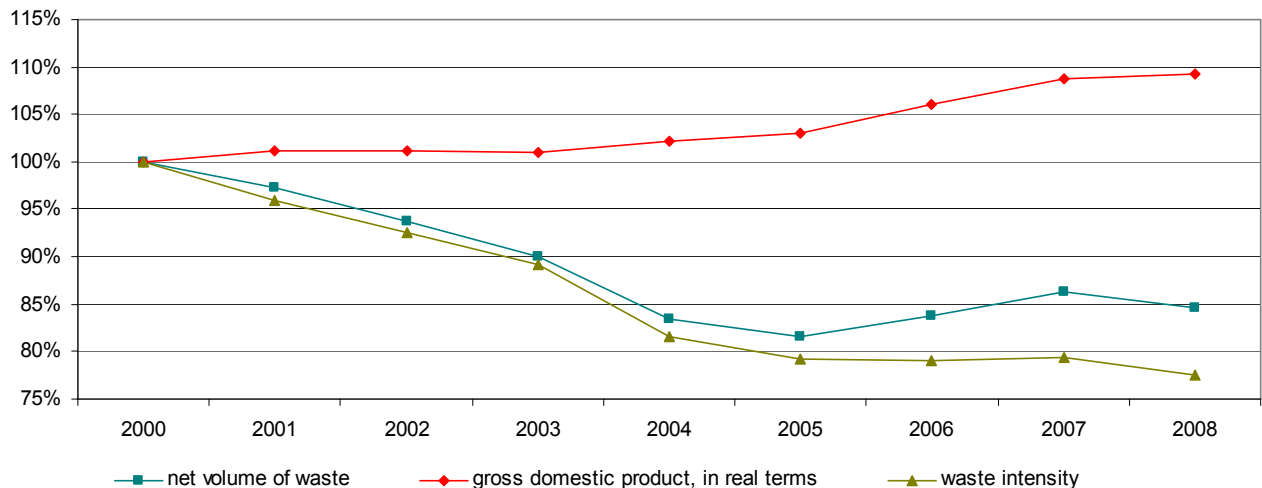


Figure 2: *Decoupling of the volume of waste from economic output, waste intensity; source: Federal Environment Agency based on data of Federal Office for Statistics*

According to the above figure, economic growth initially rose since 2000 while the total volume of waste fell. In 2004 the gross domestic product rose again, while the volume of waste continued to fall. The rise in the volume of waste in 2006 is largely due to the change in the calculation mode, from net balance to gross balance. Waste intensity, that is the total volume of waste measured on the development of the gross domestic product (linked, in real terms), fell by 21 percentage points between 2000 and 2006 from around 197 kg/000 EUR to around 156 kg/000 EUR.

Further measures to promote waste avoidance

Efforts to extend waste avoidance are not only undertaken by means of regulatory measures but also thanks to support from target group-specific campaigns and projects. The European Week for Waste Reduction, which took place from 20th to 28th November 2010, received major support from the Federal Ministry for the Environment.

For the first time campaigns and information events were held throughout Germany during this week to make people aware of the importance of waste avoidance. The initiative for this came from a number of European regional associations and the EU Commission which had been coordinating events on this topic in 22 states since 2009. 41 organisations throughout Germany were involved in the campaign week and their campaigns were coordinated by the Nature and Biodiversity Conservation Union (Naturschutzbund Deutschland e.V. - NABU) together with the Federal Ministry for the Environment.

Waste avoidance is also promoted as a key measure in production-integrated environmental conservation, as a sub-action field within the Material Efficiency Strategy and by measures initiated by Federal and State ministries.

2.1.3 Expansion of Separate Biowaste Collection

The *Draft Act for Promoting Closed Substance Cycle Waste Management* underlines the importance of the expansion of separate biowaste collection. According to § 11 of this draft act, a separate collection of biowaste should be implemented by 2015. Admittedly there is already provision today for the separate collection of biowaste amongst the majority of organisations obliged to dispose of municipal waste, but in the Federal Republic of Germany just under 50 % of households have a biowaste bin. The legislature now wants to increase this figure with a specific requirement for separate collection, without aiming for a 100 % take-up. The existing potential of green waste is also to be better exhausted.

In terms of biowaste and green waste, a current study co-financed by the Federal Ministry for the Environment assumes that an additional 2.3 million tonnes (50 % of biowaste and green waste in residual waste in 2006) can be removed from residual waste⁴ by 2020. This would consist of two-thirds of biowaste and one-third of green waste. By 2020 that would lead to a rise in separate collection of approx. 1.5 million tonnes of biowaste and approx. 0.8 million tonnes of green waste. The Witzenhausen Institute⁵ arrives at similar results relating to biowaste. According to this study, the composting and fermentation of biowaste, instead of disposing of it or recycling it, as has been the case to date, could produce an additional fall in greenhouse gas emissions of approximately 5 million tonnes of carbon dioxide equivalents per year.⁶

2.1.4 Promotion of Reusable Beverage Packaging and Ecologically Advantageous One-way Beverage Packaging

In Germany it has been compulsory since 1.01.2003 to charge a deposit on certain one-way beverage packaging. All non-ecologically advantageous one-way beverage packaging is now subject to the charging of a deposit, such as one-way PET bottles, glass bottles and tins with a volume of between 0.1 litre and 3.0 litres. This compulsory deposit is 25 cents per bottle, although there are general exceptions to the compulsory deposit for certain beverage segments, such as fruit juices, milk and milk-based drinks. Biologically degradable plastic beverage packaging, produced from a minimum of 75 % of renewable raw materials, is exempt from the compulsory deposit until 31 December 2012.

German industry and retail have succeeded in setting up an integrative national deposit-refund system in the Deutsche Pfandsystem GmbH (DPG). The DPG provides the legal and organisational framework for deposit clearing between the companies involved in the system. The DPG has also developed standards for a coherent labelling process that enables the automated return of one-way beverage packaging carrying a compulsory

⁴ IFEU, Öko-Institut (2010)

⁵ Cf. Witzenhausen Institute (2009) in relation to this.

⁶ Cf. IFEU, Öko-Institut (2010).

deposit.⁷ The promotion of reusable beverage packaging is fundamentally in line with the provisions of the *EU Waste Framework Directive* in relation to appropriate waste avoidance strategies.

2.2 Action 1-2 "Improve Resource Productivity"

The scientific debate about "resource productivity" began in Germany in the 1990s and then found its way into the Federal Government's sustainability strategy due to the formulation and definition of the aim of doubling raw material productivity. The extraction, preparation, processing and use of resources generally goes hand in hand with negative impacts on the environment, such as the emission of pollutants into water, soil and the air and the emission of greenhouse gases and increased energy consumption. Improving resource productivity is therefore undisputedly a method for driving forward the environmental development of the social market economy in Germany today and includes the successive reduction of the dependence on producing countries and raw material prices.

It is against this background that the Federal Ministry for the Environment and the Federal Environment Agency (UBA) initiated the "Material Efficiency and Resource Conservation" (MaRes) project in order to set up a national resource efficiency programme based on its findings. The Federal Ministry of Economics and Technology (BMWi) has been supporting small and medium-sized companies (SMEs) since 2006 with funded, qualified consultancy and advice on material efficiency to improve their utilisation of materials. The German Material Efficiency Agency (demea) was set up in response to this. The Centre for Resource Efficiency and Climate Protection (ZRE) was set up in 2009 as a cooperation between the Federal Ministry for the Environment and The Association of German Engineers (VDI) and acts as an information exchange for innovative efficiency technologies. The Federal Ministry for the Environment was commissioned in October 2010 to develop a national resource efficiency programme as part of the Federal Government's raw materials strategy.

2.2.1 Federal Government's Sustainability Strategy

In 2002, accompanied by a broad-based process of dialogue and consultation with social groups, the Federal Government passed its national sustainability strategy entitled "Outlook for Germany" and in the same year presented it at the World Summit on Sustainable Development in Johannesburg. It contains within 21 Actions a total of 35 medium and long-term largely quantified objectives, along with indicators for measuring their achievement and presentation of development trends. An Indicator Report is published every two years, most recently in 2010.

One objective of the national sustainability strategy is the economical and efficient utilisation of resources. It aims for a doubling of energy productivity (compared with 1990) and raw material productivity (compared with 1994) by 2020. An increase of 40.5 % had been achieved in terms of energy productivity by 2009 and an increase of 46.8 % in terms of raw

⁷ Cf. Roder M. (2009), p. 150.

material productivity, while the gross domestic product rose by 18.4 % over the same period.

The impact assessment for new laws introduced by the Federal Government in 2009 obliges all ministries developing new laws to examine their long-term impact on sustainable development and document their assessment.

2.2.2 "Material Efficiency and Resource Conservation Research Project (MaRess)"

Against the background of increasingly greater importance being attached in national politics to improving resource productivity and efficiency, the Federal Ministry for the Environment and the Federal Environment Agency commissioned a project consortium under the aegis of the Wuppertal Institute to work on the "Material Efficiency and Resource Conservation" research project, abbreviated to MaRess.

The objective of MaRess is a comprehensive and all-encompassing analysis of opportunities for resource conservation in production and consumption. Its brief is to identify potentials, analyse measures and instruments and put forward proposals for their implementation.

The project is targeted at companies, associations, trades unions, education and R&D institutions in the economy, as well as NGOs and consumer institutions, foundations, intermediary institutions and households. Further political target groups of the project include Members of Parliament, ministries and other authorities at state, Federal and EU level and the media in general. More detailed information on the project can be accessed at: <http://ressourcen.wupperinst.org/downloads/index.html>

2.2.3 German Material Efficiency Agency (demea)

In the manufacturing industry, material costs constitute the largest cost to a company at 45 % or more on average (more than twice staff costs). The material efficiency consultancy promoted by the Federal Ministry of Economics and Technology shows that SMEs can thereby rapidly and effectively reduce their costs for raw materials and materials quite significantly - on average by more than 220,000 euros per company per year. In addition they conserve resources and the environment in the long term. Over 200 qualified external material efficiency advisers are available to assist SMEs nationwide and help to identify and also develop potential savings with raw materials and materials (cf. www.demea.de). The contact for material efficiency advice for individual companies is the German Material Efficiency Agency appointed by the Federal Ministry of Economics and Technology to run the project.

SME-funding by the Centre Innovation Programme for SMEs from the Federal Ministry for Economics and Technology can be used for the more efficient material-related design of products or processes through R&D projects, encompassing individual projects as well as cooperative projects.

As part of a European project for the improvement of resource efficiency in manufacturing (REMake), the German Material Efficiency Agency is currently implementing a pilot voucher scheme for initial consultancy to SMEs to improve their efficiency with raw materials and

operating materials. This will enable companies in future to quickly obtain professional advice on the saving of material costs.

2.2.4 Centre for Resource Efficiency (ZRE)

The Centre for Resource Efficiency was set up in 2009 as a cooperation between the Federal Ministry for the Environment and the Association of German Engineers (VDI) and acts as the "technology radar" and information exchange for innovative efficiency technologies and as an information transfer point primarily for SMEs.

The objective of the Centre for Resource Efficiency is to present and promote the integrated use of environmental, resource and climate protection technologies in a generally understandable and comprehensive manner, ensuring that the often empirically proven impressive economic benefits of consultancy for SMEs in particular can increasingly be utilised to improve resource efficiency. The Centre communicates the latest approaches and research findings from the field of resource efficiency, puts professional contacts in touch with each other and presents free of charge efficiency solutions in a database it has developed in-house. For more information please refer to www.vdi-zre.de.

2.2.5 Contribution of Waste Recycling to Improving Resource Productivity

The *EU Waste Framework Directive* is currently being transposed into German legislation. It prioritises recycling compared with other forms of recovery (cf. section 2.1.2) and, in addition, according to the *EU Waste Framework Directive*, waste can be given product status under certain circumstances. The Federal Government is presently supporting the first-time implementation of this procedure at a European level for iron, steel and aluminium scrap metal in order to further boost their recycling markets.

The concept of waste management-related product responsibility as a central instrument for increasing resource productivity has been part of the *Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal* since 1996 and, to date, has been defined in specific terms for packaging, used electrical and electronic appliances, used vehicles and batteries. However, the potential recyclable materials contained in these, in particular rare technological metals, are not always ideally transferred for recycling. The opportunities for the further development of waste management-based product responsibility are now being analysed as part of a current research project.

The Federal Government is specifically working on the nationwide introduction of a dry recyclable materials bin. Three current research projects show that the recyclable materials bin will lead to a significant increase in resource productivity due to enhanced recycling, and in particular the recycling of plastics and volume metals.

Construction and demolition waste constitutes the largest percentage by volume of waste in Germany. Four comprehensive research projects have been undertaken to steer significantly more mineral construction and demolition waste towards high-quality recovery in the form of recycled concrete in the construction industry, thereby substituting it for primary resources. These projects analysed the long-term potential volumes, specific methods for returning materials to their original state free from harmful substances and the practical

uses and acceptance of recycled construction materials. The findings were presented in 2010 and published in 2011.

The increased recovery of organic waste also contributes to improving resource productivity, even although the definition of the term "resource productivity" in the German sustainability strategy only includes "abiotic" materials. The high-grade recovery of this organic waste is of particular relevance for climate protection; on the one hand owing to the reduction in harmful methane emissions from landfill and, secondly, due to energy production by the thermal recovery or generation of biogas. Of equal relevance is the retention of organic matter in the soil by the application of compost that can also be substituted for peat, thus helping to protect moorland areas. Waste avoidance and accordingly resource conservation can also be relevant, for instance with foodstuffs, that can become biowaste. The use of the phosphates contained in sewage sludge and other biowaste streams in particular is significant for resource productivity. Processes are currently being researched for the recovery of phosphates from bone meal or sewage sludge ash to use phosphates in waste streams that are not suitable for direct use on soils.

2.2.6 Chemical Leasing

Approximately up to 30 percent of chemicals can be saved by the use of the chemical leasing business model. The Federal Environment Agency contracted out a research project "Chemical Leasing as a Model for Sustainable Development and with Test Procedures and Quality Criteria Based on Pilot Projects in Germany" to identify the optimum applications for chemical leasing and support its further prevalence.

The pilot projects demonstrate benefits for the environment and business in different sectors of industry, for instance in the food and pharmaceuticals industry (container cleaning), construction industry (glass adhesion by the use of adhesive tapes) or in the coating and treatment of metal surfaces. This significantly lowers the use of chemicals as process auxiliary agents and thereby results in lower impact on the environment due to fewer emissions. In the pipe and container cleaning sector, 10 percent fewer stabilisers, 25 percent fewer solvents and 30 percent less acid were used, and at the same time 25 percent less waste water was produced, 10 percent less waste generated and 10 percent less energy was used.

With chemical leasing, the chemical products (for instance paint) for a chemical-based service (for instance automotive painting) are no longer sold to customers, but rather the entire service is sold. With chemical leasing, the chemical manufacturer becomes a service provider, trading in the knowledge and expertise for the use of its chemical and also assuming responsibility for occupational health and safety and environmental conservation.

Application-based quality criteria for chemical leasing focussing on environmental conservation and health protection were developed to assess the success of the project and were evaluated in the aforementioned pilot projects. A certification system for chemical leasing was developed based on these criteria that can be applied, if required, by external experts and used by the companies themselves.

2.3 Action 1-3 "Pursue Co-benefits between the 3Rs and Greenhouse Gas Emission Reductions"

2.3.1 Principles of Landfill and the Landfill Ban on Untreated Waste

The construction and operation of a landfill in Germany is coupled to a *multi-barrier concept* that can be translated worldwide to minimise the negative impact of landfill sites on the environment. This concept comprises six barriers:

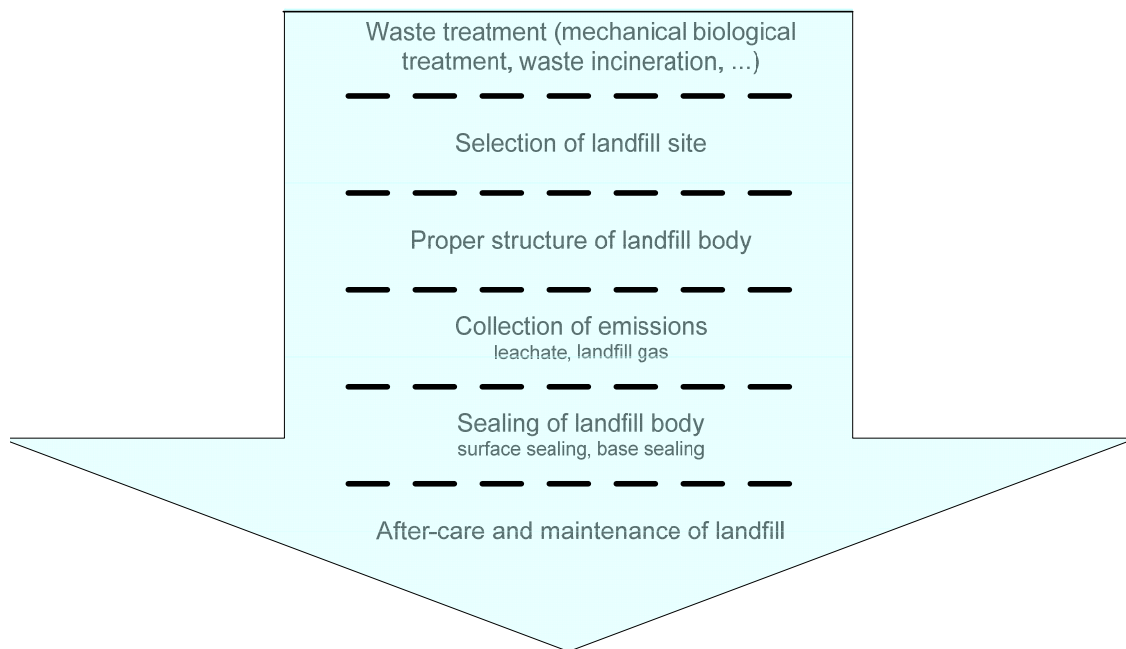


Figure 3: Multi-barrier concept for landfill sites

Essentially the barriers "Waste treatment" and "Collection of emissions" are crucial for the avoidance of GHG emissions from landfill waste. Technical standards were established in the 1990s in Germany to ensure the effectiveness of these barriers.

Among other things, the Technical Instructions on Municipal Waste (TA-SiedlAbf) that have been in effect since May 1993 made specific provisions for sealing systems for landfills. They regulated the construction and surface sealing methods, as well as landfill base seals and landfill gas collection systems and also stipulated that untreated waste could no longer be deposited in German landfill sites from June 2005 onwards.

Prior to this, the requirement profile of the waste to be deposited was extended with foresight by the *Waste Disposal Ordinance*.⁸ This *Ordinance* originated in the course of discus-

⁸ Ordinance on the Environmentally-compatible Landfill of Municipal Waste dated 20 February 2001; AbfAbIV; BGBl. I, page 305; amended by Article 2 V of 24 July 2002 BGBl. I, page 2807

sions about an alternative method for the pre-treatment of waste prior to incineration in a mechanical biological waste treatment plant.

As well as stipulating the maximum loss on ignition, the *Waste Disposal Ordinance* also defined the gas formation potential and the respiration activity of the waste to be deposited as criteria for depositing. This was to ensure that there was a reduction of more than 90 % in the development of greenhouse gases – especially methane – from biologically active municipal waste in landfill sites, thereby shortening the aftercare period for landfill sites.

The aforementioned *Ordinance* was enacted on 1 March 2001 together with the 30th Ordinance on the Implementation of the *Federal Immission Control Act (30. Bundesimmissionsschutzverordnung - BImSchV)*, which specifically regulates the emissions of mechanical biological waste treatment plants. One focus in this is on the prevention of methane, ammonia and nitrous oxide emissions produced during the (pre-)treatment of the waste. This ensures that emissions are thus not only prevented when the waste is deposited but that emissions can be captured and minimised in their (pre-)treatment in appropriate plants. The limits are stipulated in the 30th Ordinance on the Implementation of the *Federal Immission Control Act* and are based on the bulk freight per treated unit of waste. This ensures that the greenhouse gas emissions produced at each biological treatment stage in a mechanical biological waste treatment plant essentially equate to those of waste incineration plants – regulated by the *17th Federal Immission Control Ordinance (17. BImSchV)*.

The *Landfill Ordinance (Deponieverordnung - DepV)* came into effect in Germany in July 2009 to simplify landfill legislation and improve working with it. It combines legislation on landfill that to date had been provided in three ordinances and three administrative provisions and harmonises the requirements to the different landfill classes.

2.3.2 Reduction of Greenhouse Gases by the Transformation of the Waste Sector

According to the National Inventory Report, the emissions reported in the "Waste" reporting sector in the period from 1990 to 2006 fell from 40.4 million t to 12.3 million t CO₂e equivalents (CO₂e) p. a.⁹ The contribution made by the waste industry up to 2006, a reduction of approximately 70%, was well above the percentage drop in total emissions.

A further life cycle analysis study co-financed by the Federal Ministry for the Environment confirms this contribution by the waste management to climate protection. According to this life cycle analysis, the impact on the atmosphere by the German waste sector of approx. 37.8 million t CO₂e in 1990 was overcompensated and thus a reduction of approx. -18 million t CO₂e was determined for 2006. A saving of just under 56 million t CO₂e could therefore be achieved in Germany from a life cycle analysis perspective, thanks to efforts in waste management.¹⁰

⁹ Alongside methane emissions from landfill, the sector also includes methane and nitrous oxide emissions from biological treatment (including mechanical biological waste treatment plants) and nitrous oxide and methane emissions from waste water treatment.

¹⁰ Unlike inventory reporting, life cycle analyses also take into consideration the contributions of waste management to reducing emissions in other industrial sectors, for instance by the substitution of power from energy recovery from waste for power from fossil sources.

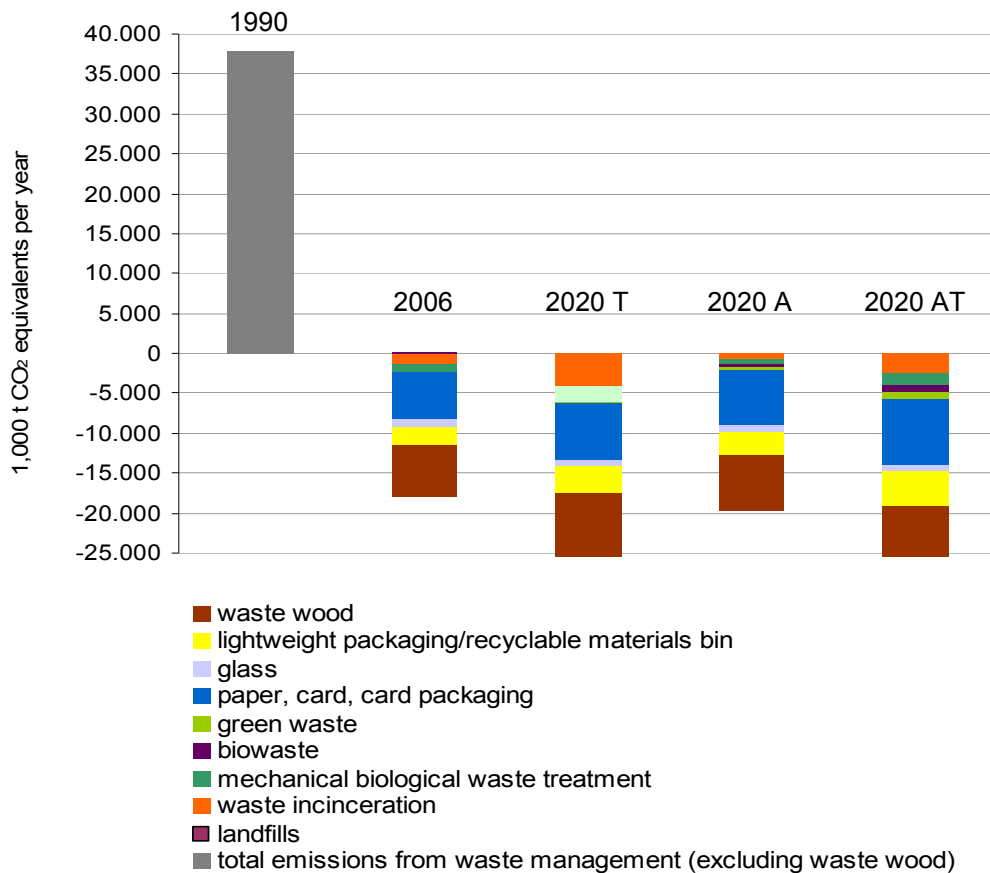


Figure 4: Climate protection potential of the waste management industry in Germany; source: IFEU – Institute for Energy and Environmental Research, Öko-Institut (2010),

The marked reduction of greenhouse gas emissions from waste management in Germany with an almost constant volume of municipal waste is based on a whole series of measures coordinated with each other, both in terms of content and timing, These include in particular the thermal or mechanical biological pre-treatment of all non-recyclable municipal waste and the collection and recycling of landfill gases produced in former landfill sites.

Depending on future developments in the separate collection of waste and technical standards (represented by the scenarios T, A and AT) further reductions in greenhouse gases are considered possible by IFEU and Öko-Institut by 2020.

2.3.3 Waste for Energy Recovery

The national implementation of the *EU Waste Framework Directive* will stipulate that in future the incineration of waste can only be regarded as energy recovery if the waste incineration plant has an energy efficiency factor¹¹ of > 60 % (with old plants) and > 65%

¹¹ The energy efficiency factor is derived from the ratio between energy input and energy output, according to a formula in the *EU Waste Framework Directive*.

(with new plants) in terms of its use of energy. It is currently assumed that only three plants in the Federal Republic will not gain recycling status.

At Federal level, the Combined Heat and Power Act (originally from 2002) and amended in 2009 and the KfW Credit Bank for Redevelopment's market stimulus programme promote heat grids; the latter relates to if more than 50% of heat originates from renewable energy. These financial assistance measures are intended to provide incentives for increasing the speed of the expansion.

Heat from waste incineration plants is regarded pro rata as regenerative providing there is a minimum percentage of 50 % of biomass in the waste and the same applies to the *Renewable Energies Heat Act* (Erneuerbare-Energien-Wärmegesetz - EEWärmeG, 2009). The Renewable Energies Heat Act specifies ambitious standards for the percentage heat requirement of new buildings that must be met by renewable energy. Under this requirement, the use of thermal energy from combined heat and power plants (CHP) or heat from heat grids fed from waste incineration plants is permitted for the heating of buildings.

A further contribution to increasing energy and material recovery from waste is made by the 2004 *Renewable Energy Act* (EEG, revised 25.10.2008). Combined with the *Biomass Ordinance* (*Biomasseverordnung - BiomasseV, 2001*), the *Renewable Energy Act* promoted incentives for the increased use of biomass and such biowaste, energy from which to date had only been used to a lesser extent, for energy generation. A sustainability certificate must be submitted for liquid biomass used (*Biomass-Electricity Sustainability Ordinance, 2009*) since 1.1.2011. If the provisions of the ordinance are met, a minimum tariff can be paid for electricity fed back into the grid when liquid biomass is used in combined heat and power plants. There is an exemption clause for waste cooking oil. The tariff is guaranteed for a period of 20 years and thus gives investors long-term planning security.

Furthermore a bonus ruling in the *Renewable Energy Act* initiates the development of new techniques for improved energy and material use from waste. The objective of this is to improve efficiency of energy generation from waste, for example. A progress report on the *Renewable Energy Act* is currently being produced that will act as the basis for the adaptation of the remuneration rules within the framework of a new amendment of the *Renewable Energy Act*.

2.4 Action 1-4 "Technical Innovation and Environmental Design"

2.4.1 EU Eco-design Directive

The term "Eco-design" is understood as meaning a systematic procedure, by means of which environmental aspects are incorporated in the product planning, product development and product design process as early as possible. This means that the requirement to have "as minimal an environmental impact as possible" is added to more traditional criteria in product development, such as cost-effectiveness, safety, reliability etc. The objective is to develop products that require a minimum of resources and energy to function correctly and only contain harmful substances that are indispensable to enable them to function properly. These requirements apply to the entire life cycle of the product.

The so-called *Eco-design Directive*¹² is an integral component of the European Union's *Integrated Product Policy* (IPP). The Federal Government, under the aegis of the Federal Ministry of Economics and Technology, has implemented the directive into German legislation with the *Act on Energy-Operated Products* (EBPG) of 27 February 2008. The amended directive came into effect on 20 November 2009¹³ and extended the scope of the *EU Eco-design Directive* to products, the use of which has an impact on energy consumption (so-called ErPs).¹⁴ The amended directive will be implemented at national level by adaptation of the *Act on Energy-Operated Products* (EBPG). In terms of 3Rs, it is relevant that the *EU Eco-design Directive* is not only aimed at improving energy efficiency but, to a far greater extent, permits consideration of the recyclability of the products that fall under its jurisdiction. However, under the so-called "Implementing measures", recycling by contrast plays a subordinate role.

2.4.2 Green Public Sector Procurement

Public sector procurement amounts to approximately 13 % of the gross domestic product in Germany. Greater consideration of environmentally-related criteria in public sector procurement processes is therefore an important measure of product-related environmental conservation. By means of targeted "Green Public Procurement", public sector players can do justice to their function as role models and at the same time contribute towards innovative environmentally-friendly products increasingly being developed and being launched onto the market faster and more easily.

The most important national legal bases for the consideration of environmental concerns in public sector procurement in Germany are the *Tendering and Contract Procedures VOL/A*, *VOB/A* and *VOF*, the *Ordinance on the Award of Public Contracts* and the *Cartel Act (GWB)*. The *European Utilities Directive 2004/17/EC*¹⁵ and *Public Contracts Directive 2004/18/EG*¹⁶ have been largely implemented into German legislation (www.bmwi.de). A new *Sector Ordinance* has become law to simplify and modernise German tendering law

¹² Directive 2005/32/EC of the European Parliament and the European Council of 6 July 2005 for the creation of a framework for the requirements of environmentally sound design of energy-operated products and for the amendment of Directive 92/42/EEC of the Council and Directives 96/57/EC and 2000/55/EC of the European Parliament and Council.

¹³ Directive 2009/125/EC of the European Parliament and the Council of 21 October 2009 for the creation of a framework for specification of the requirements for the environmentally sound design of products, the use of which has an impact on energy consumption.

¹⁴ As is clear from the EC Eco-design Directive, these are objects, the use of which has an impact in some way on the consumption of energy. This fundamentally encompasses products that do not consume energy themselves but have an impact on the consumption of energy during their use (e.g. the Directive cites insulating material and windows as examples).

¹⁵ Directive 2004/17/EC of the European Parliament and the Council from 31 March 2004 for the coordination of the issuing of a surcharge by customers in the Water, Energy and Transport Ordinance and Postal Services ("Sector Directive", OJEU. L 134, 30.04.2004)

¹⁶ Directive 2004/18/EC of the European Parliament and the Council from 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts ("Classical Directive", OJEU. L 134, 30.04.2004)

and the *Tendering and Contract Procedures* and the *Ordinance on the Award of Public Contracts* have also been amended.

Moreover, § 37 of the *Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal* includes regulations for environmentally-friendly procurement, which are correspondingly to be retained in the pending revisions of the *Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal* in the form of the *Act for Promoting Closed Substance Cycle Waste Management*. At Federal level, with the Regulation of Procurement for Timber Products and the general administrative provision for the procurement of energy-efficient products and services, there are now further regulations that prescribe the compulsory consideration of environmental aspects.

Germany thus has anchored in legislation relating to tendering a series of regulations that ensure the broad consideration of environmental concerns combined with the premise of cost-effectiveness when awarding contracts. Decisions are currently being made still too often from the point of view of short-term costing; longer-term life cycle costs that are caused, for instance by the remediation of environmental damage and its consequences, are not included in the equation. In the knowledge of this shortcoming, the Federal Environment Agency is involved, for instance, in the preparation of framework contracts for the so-called "Federal Shopping Centre"¹⁷ that take into consideration environmental concerns. Furthermore the Federal Environment Agency is also supervising the procurement website www.beschaffung-info.de, by means of which customers are offered current information on legislation relating to tendering and various working aids (sample specifications, hands-on examples etc.). The Federal Ministry for the Environment thrust the issue of sustainable procurement into the spotlight as a cooperation issue between the Federation, federal states and local authorities. If nothing else this initiative resulted in the gradual setting up of an "Alliance for Sustainable Procurement" under the aegis of the Federal Ministry for Economics and Technology in accordance with the resolutions of Conference of Heads of State and Senate Chancelleries of the Federal states with the Head of the Federal Chancellery on 7 May 2009 and 18 November 2010. The Federal Ministry for the Environment is also instrumental in the preparation of the programme of measures passed on 6 December 2010 entitled "Sustainable Federal Government" that also includes a tranche of voluntary agreements relating to public sector procurement.

2.4.3 Environmental Innovation Programme

Demonstration projects on a commercial scale are promoted within the framework of the Environmental Innovation Programme (UIP) that has been in existence since 1979. These projects show for the first time how environmental impacts can be prevented or minimised. The projects are intended to include or present progressive technological processes and combinations of processes for the reduction of environmental pollution. The technical innovations should be transferrable to comparable companies to create a multiplier reaction. Important findings about the forward projection of environmental legislation are being gained from these projects with the result that the Environmental

¹⁷ Cabinet decision on the optimisation of public sector procurement from 10.12.2003

Innovation Programme is also a key instrument for the development of environmental policy. Since the start of the programme, over 700 projects have been funded (www.bmu.de), with small- and medium-sized companies having priority in terms of funding. Research and development projects cannot be funded within this programme.

2.4.4 German Federal Foundation for the Environment

The German Federal Foundation for the Environment (DBU) was set up in 1990 with funding from the sale of the state-owned company Salzgitter AG and since embarking on foundation work in 1991 it has evolved into one of the largest foundations in Europe. The German Federal Foundation for the Environment finances innovative and exemplary environmental conservation projects in the fields of environmental engineering, environmental research / nature conservation and environmental communication, with particular consideration to small- and medium-sized companies. Projects on environmentally-friendly and health-friendly processes and products are classes under environmental engineering, particularly in the fields of water recycling and construction engineering, climate protection and energy, as well as architecture and building.

In the 19 years since it was set up, the German Federal Foundation for the Environment has supported more than 7,600 projects with funding of around € 1.35 billion. In addition, the Foundation has also awarded the annual German Environment Prize since 1993 and, with prize money of € 500,000, it is the most lucrative environmental prize in Europe. It is awarded for work that has decisively and in an exemplary manner contributed to the protection and conservation of the environment and will in future lead to significant easing of the impact on the environment. For more information refer to www.dbu.de.

2.4.5 Innovation Funding by the r² and r³ Programmes

Within the new 2020 High-tech Strategy and the Master Plan for Environmental Technologies, the Federal Ministry for Education and Research (BMBF) is promoting the development of innovative efficiency technologies and services as part of the framework programme entitled "Research for Sustainable Developments" (FONA). For this purpose and to drive forward the objectives of the national Sustainability Strategy (cf. Section 2.2.1), the funding measure "r²: Innovative Technologies for Resource Efficiency – Raw Material-intensive Production Processes" was set up in 2009. It finances projects that contribute to a more economical use of quantitatively and strategically important raw materials that cannot currently be substituted or can only be substituted with difficulty in high-grade technological applications (such as titanium, indium and ruthenium). Over 100 individual projects are concentrated into 22 groups and financed with approximately 36.5 million euros (www.r-zwei-innovation.de). The research projects are spread across the fields of metal production and recycling, the chemical industry, ceramics and construction materials.

Small and medium-sized businesses, the driving force behind efficient technologies, receive targeted support from the Federal Ministry for Education and research (BMBF).

In the follow-up programme to r² that has the full title "r³ Innovative Technologies for Resource Efficiency - Strategic Metals and Minerals", innovative projects, such as for the recovery of reusable materials from anthropogenic deposits ("urban mining") have been financially supported since 2011.

3 Goal 2 "Establishment of an International Sound Material-Cycle Society"

Goal 2 calls on the G8 states to cooperate more closely to optimise international material cycles. The central actions are viewed, on the one hand, in the improvement of the framework conditions for an environmentally-friendly exchange of resources, goods and materials and, on the other hand, in intensified international trade with products and goods that are in accord with the goals of the 3R Initiative. The intense debate about the measures required to achieve these goals demonstrates that what is needed here is a balancing act: the exchange of products and goods is to be further expanded, however if the materials are more waste-based than product-based, then trade with them should only take place under restrictive conditions to preventatively prohibit waste disposal dumping in other countries.

3.1 Action 2-1 "Collaborate to Promote Sound International Resource Circulation"

A brief statement about the international agreements that Germany has contractually committed to execute, appears prior to the report about the measures already taken by Germany under Action 2-1. This commitment has either been made directly by the signing of agreements under international law by Germany or due to Germany's membership of the EC or EU.

3.1.1 International Obligations on the Part of Germany Relating to Cross-border Transfer of Waste and Their Implementation

Consideration must be given to regulations under international law and to a series of legal specifications in the fields of cross-border transfer of waste and recycling management. These are intended, in principle, to work towards hazardous and other waste being disposed of in an as environmentally-friendly manner as possible and ensuring that there are no negative effects on the environment. It was impossible to adequately control the cross-border transfer of "waste for recovery" in particular in the 1980s and 1990s that was not governed by waste legislation. This waste often sought out the cheapest route to disposal and, in isolated cases, waste such as this was transferred abroad by waste disposal contractors, often to Eastern European countries, without the knowledge of the German authorities. Policing and regulatory provisions were unable to force the perpetrator to reverse the transaction, as the possibilities offered by policing and regulatory law were limited to transactions that took place in Germany. In a number of cases, for foreign policy reasons, waste had to be returned to Germany using public money and disposed of in Germany.

In the successive years, policies were developed at national and international level (EU, OECD, UNEP) with the active involvement of Germany to make the illegal shipment of waste abroad more difficult and improve the possibilities for control on the part of the authorities. The following regulations are worth noting in this respect:

- *EC Hazardous Waste Directive*, December 1991

- *Basel Convention* from 22 March 1989 on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, amended in 2002 and 2003
- *Implementation Act on the Basel Convention* in October 1994
- OECD Council Decision C (2001)107 on the control of transboundary movement of waste destined for recovery operations
- Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste (VVA)
- *Waste Movement Act* (AbfVerbrG) from July 2007
- EC Regulation on the export of green-listed waste for recovery in non-OECD third countries. Commission Regulation (EC) N.1418/2007 of 29 November 2007
- *EU Waste Framework Directive* (EU-AbfRRL) of November 2008

The sections below discuss several of these regulations in greater detail giving an impression of the cohesion between these regulations and their implementation by Germany.

3.1.2 The Basel Convention and Development of Waste Exports from Germany

The European Union made the content of the Basel Convention legally binding for all member states with the *EC Waste Shipment Regulation* (EEC 259/93). The above Regulation was superseded in 2006 by the Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste (*Waste Shipment Regulation - WSR*). The new Regulation implements the amended *Basel Convention* and the *OECD Council Decision C (2001)107/Final* into immediately applicable Community legislation.

Special export provisions (known as "Correspondents' Guidelines") were agreed at EC level in relation to the *Waste Shipment Regulation (WSR)* and set out the common understanding by the member states as to how the *Waste Shipment Regulation* should be interpreted.

The table below shows how the export of waste arising in Germany and covered by notification control has developed since 1998. The volume in 2009 was significantly lower than in 1998, although very high figures were nevertheless recorded in several years.

Table 1: *Timeline of export volume of waste arising in Germany and requiring notification control since 1998 in 1,000 t; Source: Federal Environment Agency¹⁸*

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1.381	1.289	1.627	1.540	1.262	907	1.038	1.102	1.966	1.825	1.561	1.201

Note: Further statistics are available at www.umweltdaten.de

¹⁸ <http://www.umweltbundesamt.de/abfallwirtschaft/abfallstatistik/dokumente/ZeitreiheExportAbfallarten.pdf>

3.1.3 Controls on the Prevention of Illegal Transport and Sham Recovery of Waste

The regulations on the control of waste shipment are clearly contained in the WSR and in the German Waste Transportation Act (Abfallverbringungsgesetz - AbfVerbrG). In spite of the discontinuation of compulsory goods controls in May 2004, an official inspection can be carried out at the place of production of the waste, in the treatment plants, in the waste disposal plants and during transportation of the waste at any time. Mobile deployment forces, together with the police, customs and environmental authorities, monitor the transport of waste especially in border regions.

The German Maritime Employer's Liability Insurance Association has directed its attention in the past to specific hazardous materials, such as asbestos, for marine vessels flying under the German flag owing to national occupational health and safety regulations and German Maritime Employers' Liability Insurance Association marine accident prevention regulations (UVV See). If no asbestos-free certification can be provided, shipping companies require an asbestos register and special protective equipment on board. This is checked and asbestos measurements are performed if need be. There are statutory bans on marine vessels carrying the German flag for refrigerants harmful to ozone (*Halon Prohibition Ordinance*) or for TBT-containing anti-fouling paints (EU-wide ban since 2003).

The Maritime Safety Agency can support shipping companies in producing inventory lists. When new vessels become operational, construction contracts stipulate that a certified inventory list of hazardous materials is to be produced on the ship.

3.1.4 Regulations on Waste Electrical and Electronic Equipment in the EU and Germany

With the Directives 2002/95/EC ("on the restriction of the use of certain hazardous substances in electrical and electronic equipment", abbreviated in English to "RoHS") and 2002/96/EC ("on waste electrical and electronic equipment", abbreviated in English to "WEEE") from 2002, the EU is aiming to improve the environmentally-friendly disposal of waste electrical and electronic equipment and to reinforce manufacturers' responsibility. The EU Directive was implemented in German legislation in 2005 with the law on the putting into circulation, return and environmentally-compatible disposal of electrical and electronic equipment (*Electrical and Electronic Equipment Act, Elektroaltgerätegesetz – ElektroG*). The provisions of the *Electrical and Electronic Equipment Act* aim to minimise the negative environmental effects of electrical and electronic equipment and, in doing so, take into account the entire life cycle. The *Electrical and Electronic Equipment Act* stipulates the following waste management goals:

- Avoid waste from electrical and electronic equipment or reduce it by recycling and recovery and
- reduce the inclusion of harmful materials from electrical and electronic equipment in waste (§ 1 Art. 1 Clause 2 *Electrical and Electronic Equipment Act*).

The *Electrical and Electronic Equipment Act* includes the following provisions among others:

- the aim of collecting annually at least four kilograms of waste electrical and electronic equipment per inhabitant from private households,
- restricting the use of certain hazardous substances in electrical and electronic equipment,
- economically feasibility testing for the possibility of reusing entire appliances or individual components,
- recovery quotas of between 70% and 80 % and recycling quotas of between 50 % and 80% and
- special treatment measures to reduce harmful materials.

The *Electrical and Electronic Equipment Act* sets out specific obligations for the manufacturers of products, retailers, local authorities, the owners of electrical and electronic equipment and waste disposal companies. In compliance with the shared product responsibility provided for in the Act, manufacturers are responsible for all disposal steps following collection. This involves in particular organisation and financing of the collection of the electrical and electronic equipment from municipal waste collection or transfer centres and its disposal in accordance with the regulations. The disposal companies governed by public law, by contrast, are responsible for the setting up and operation of the collection points. Since the *Electrical and Electronic Equipment Act* became law, it is compulsory that citizens take their waste equipment to a collection point separate from municipal waste. The return of waste electrical equipment to disposal companies regulated under public law is free since the *Electrical and Electronic Equipment Act* became law.

3.1.5 Stockholm Convention

Persistent Organic Pollutants, abbreviated to "POPs", degrade with difficulty, accumulate in the food chain and in the fatty tissue of living organisms and have unwanted effects on human health and on the environment. Within the framework of the Stockholm Convention (POP Convention), the international community agreed to a ban on POPs to reduce the quantity of them.

The Stockholm Convention became law on 17 May 2004 following its ratification by 50 signatory states and promotes the avoidance and reduction of the contamination of the environment by some 21 pollutants. The UN-ECE (Economic Commission for Europe) POP Protocol on four further POPs became law on 23 October 2003 and compels the contracting member states to develop strategies, policies and programmes to meet the obligations of the Protocol.

The Stockholm Convention and the POP Protocol were implemented in the European Union by Regulation (EC) 850/2004. Under this measure the member states are subject to a reporting obligation to produce a national emission inventory of POPs every year. The inventory includes air pathway emissions, identifies primary source groups of these substance groups and weak points and gaps in the recording of emission data. Specific emission factors were created for Germany based on existing databases, with the help of which emission forecasts can be produced.

As the production and use of POPs is already prohibited, from Germany's point of view, the focus should now be on the identification of new POPs and their inclusion in the legislation. A national action plan is intended to highlight measures for further minimisation of POPs.

3.1.6 Legal Regulations on Recovery of End of Life Vehicles

The environmentally-compatible disposal and recovery of end of life vehicles is regulated in Germany by the *End of Life Vehicle Ordinance (Altfahrzeugverordnung - AltfahrzeugV)* of 21 June 2002. The *Ordinance* implemented the provisions of the *End of Life Vehicle Directive 2000/53/EC* of 18 September 2000 into national law. According to § 2 Art. 1 No. 2 of the *End of Life Vehicle Ordinance*, "end of life vehicles" are vehicles that constitute waste according to § 3 Art. 1 of the *Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal*. It is decisive according to this Act whether the owner of a vehicle disposes of his vehicle, wants to dispose of his vehicle or has to dispose of his vehicle.

In accordance with the *End of Life Vehicle Ordinance*, the manufacturers of vehicles have created nationwide opportunities for returning vehicles. End of life vehicles must be returned to an accredited collection point, an accredited return point or an accredited demolition company. The operators of demolition companies have a duty only to take the remaining vehicle bodies to accredited shredder plants. In 2008 there were 1,189 demolition companies and 48 shredder plants in Germany.

The *End of Life Vehicle Ordinance* prescribes binding quotas for recycling and recovery. From 1 January 2006 a minimum of 85 percent by weight and, from 1 January 2015, a minimum of 95 percent by weight of all abandoned vehicles must be brought for recycling or recovery based on their average unladen weight. Recycling and material recovery must make up 80 percent by weight from 1 January 2006 and a minimum of 85 percent by weight from 1 January 2015, thus leaving a margin of up to 10 percent by weight for energy recovery.

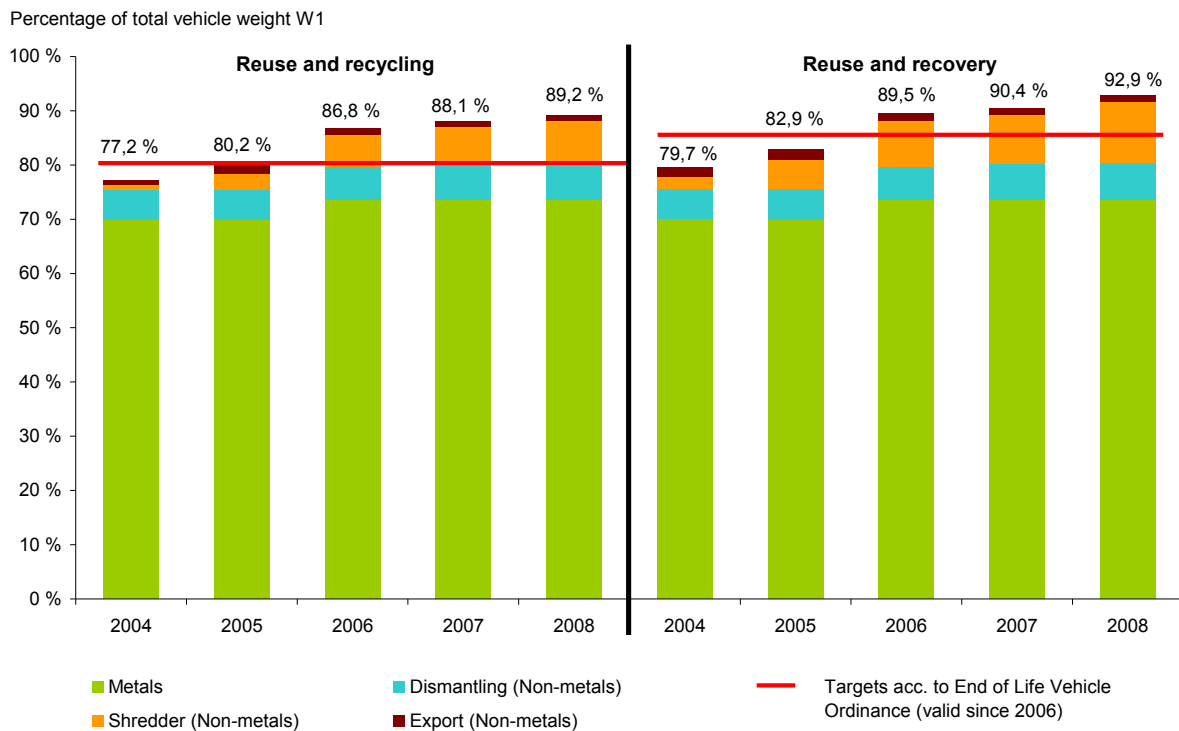


Figure 5: End of life vehicle recovery quotas in Germany from 2004 to 2008; Source: Federal Environment Agency¹⁹

3.2 Action 2-2 "Trade of Products and Goods and Transboundary Waste Shipment"

Action 2-2 deals with initiatives for greater international trade in secondary raw materials whilst at the same time adhering to the disposal standards to be complied with. Of particular importance in this respect is the fact that the detailed proposals contained in the *Kobe 3 R Action Plan* necessitate close cooperation, both bilateral between import and export countries, and based on multilateral agreement, for instance the OCED or Basel Convention.

Relating to points 2 and 4 of Action 2-2, reference is made in this report to other chapters. This section is therefore devoted specifically to points 1, 3 and 5.

3.2.1 Distinction Between Waste and Non-waste

An important issue in waste management, both within a national and international context, is the distinction between waste and non-waste. If a material qualifies as waste, then this also affects its shipment across borders in particular. The decision about whether an object constitutes or does not constitute waste,

¹⁹ Download at: http://www.bmu.de/files/pdfs/allgemein/application/pdf/germany_elv_quota_qualityreport.pdf

- a) affects the subjective perception of a material and, in the event that it meets "waste" criteria, can quickly stigmatise a material, and
- b) in the event of a planned shipment, providing the material is not green-listed, can necessitate a notification procedure associated with time-consuming administration.

In order not to inhibit international trade with non-hazardous waste on the green list for recovery in view of point b), this waste is not subject to notification when it is shipped from Germany to another OECD country or within member states. Shipping information is all that is needed, making transboundary trade much simpler. By contrast, a notification procedure is prescribed for "yellow listed waste".

The *EU Waste Framework Directive* provides a regulation for distinguishing between waste and non-waste by means of a clear definition of the terms *by-products* and *end of waste criteria*. The end of waste "criteria" is deemed to have been met if binding defined criteria are met. Accordingly a material is no longer waste if

- the relevant item is commonly used for specific purposes,
- if there is a market or demand for the item,
- the item meets the technical requirements for the named specific purposes and meets existing legal regulations and standards for products and
- the use of the item as a whole does not lead to harmful consequences to the environment or health.

End of waste criteria are defined in accordance with Article 6 Clause 2 of the *Waste Framework Directive* beyond the directive in the Comitology procedure.²⁰ Primary waste streams are thus aggregates, paper, glass, metal, tyres and textiles. A study is currently underway by the EU's Joint Research Center (JRC) in Seville with the aim of developing a method for defining "end of waste criteria" based on three case studies. The studies deal with the following three material streams:

- compost
- granular rock material
- scrap metal

The studies intend to develop a methodology and put forward general regulation proposals, without proposing limits.

Until the EU criteria are defined, the member states can decide themselves on the end of waste criteria taking into consideration the applicable jurisdiction and noting the duty for notification.

²⁰ In the comitology procedure, the European Parliament and the Council decide on the fundamental provisions of legislative acts and transfer to a specialist committee the regulation of its technical implementation. These specialist committees are sat on by representatives of the member states under the direction of the Commission.

3.2.2 Imports and Exports of Waste and Secondary Raw Materials

Secondary raw material streams are increasingly shifting into the focus of manufacturing industry's procurement strategies. Both the import and the export of waste not requiring compulsory notification have increased in recent years. Even if transboundary trade with secondary raw materials is beneficial for increasing demand, this goes hand in hand with risks in terms of achieving the goals of the 3R Initiative; risks exist, for instance by supplying plants in which environmental standards are being inadequately complied with.

The growth in the volume of waste not requiring compulsory notification imported into Germany and exported abroad from 1991 to 2007 is shown in Table 2.

Table 2: *Timeline showing import and export volumes of waste not requiring compulsory notification since 1998 in 1,000 t; Source: Federal Environment Agency²¹*

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Export	15.509	15.497	15.959	16.450	15.375	15.309	16.149	15.988	18.088	19.416
Import	7.516	7.538	8.591	8.444	9.115	10.314	11.577	10.811	12.179	14.099
Bottom line	7.993	7.959	7.368	8.006	6.260	4.995	4.572	5.177	5.909	5.317

A positive bottom line means that Germany is shipping more waste not requiring compulsory notification abroad than is imported into Germany. Clinkers, ash and mill scale, along with iron and steel scrap, make up a large proportion of the export. The volumes of exported and imported waste classed as "not requiring compulsory notification" have increased since 1998 with imports having almost doubled.

The growth of waste requiring compulsory notification imported to Germany and exported abroad from 1998 to 2009 is shown in Table 3.

Table 3: *Timeline showing import and export volumes of waste requiring compulsory notification since 1998 in 1,000 t; Source: Federal Environment Agency²²*

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Export	1.381	1.289	1.627	1.540	1.262	907	1.038	1.102	1.966	1.825	1.561	1.201
Import	701	1.044	1.985	2.630	3.934	4.854	6.492	5.965	5.628	6.240	6.854	7.627
Bottom line	680	245	-358	-1.090	-2.672	-3.947	-5.454	-4.863	-3.662	-4.415	-5.293	-6.426

Note: Further statistics can be found at www.umweltdaten.de

The bottom line has reversed since 1998; whereas in 1998 twice the volume of waste requiring compulsory notification was exported as imported, imports have since quadrupled

²¹ <http://www.umweltbundesamt.de/abfallwirtschaft/abfallstatistik/dokumente/ZeitreiheAussenhandelAbfallartenExport.pdf>

and exports have even dropped slightly. A key reason for this is the availability of high-performance treatment and recovery capacities in Germany that are also increasingly attracting interest abroad. The removal of hazardous substances from waste from countries with a less-developed disposal infrastructure is in the spirit of the *Kobe 3R Action Plan*, but leads again and again to controversy amongst the German public.

²² <http://www.umweltbundesamt.de/abfallwirtschaft/abfallstatistik/dokumente/ZeitreiheExportAbfallarten.pdf>

4 Goal 3 "Collaborate for 3Rs Capacity Development in Developing Countries"

The implementation of 3R should not remain limited to the industrial countries and large emerging nations. The potential for climate protection and increasing resource efficiency should also be identified in the developing countries. This is not least because consumer behaviour in these countries is changing, mostly towards packaged goods. The availability of recycling techniques could help just as much there as solutions for the prevention of methane emissions from landfill sites and the setting up of more efficient collection structures.

Germany's development cooperation can look back on many years of experience with sustainable projects in a large number of partner countries. The coordination of projects in these countries is continuing to improve and the focus areas in the 3R fields are increasingly directed towards climate protection and resource conservation.

Key pillars and measures in Germany's cooperation with developing countries that support the 3R Initiative are described below. The transfer of technologies and knowledge and expertise plays a key role in this.

Goal 3 also includes, somewhat out of line with the actual wording, in Action 3-3 "Cooperation with Stakeholders", measures that initially have to take place in the home country. With regard to the goals of the 3R Initiative, experience gathered through dialogue with stakeholders or the further dissemination of environmentally-related data and information at national level, can also be of value for similar processes on an international level.

4.1 Action 3-1 "Cooperation with Developing Countries"

4.1.1 Bilateral and Multilateral Cooperation

From 1999 to March 2009 the KfW Credit Bank for Development had approved funding of 177 million euros for sixteen waste management projects in eight partner countries. Others are in preparation, primarily in Southeast Europe, in the Middle East, North Africa, East Asia and South Africa. By anchoring them in an intensive sector dialogue with partners and with the support of specific reform stages (laws, ordinances, institutions etc.) often in cooperation with the "German Society for International Cooperation – GIZ" (up to 31.12.2010 "Society for Technical Cooperation – GTZ"), the projects have a structure-forming effect. They reinforce the appropriate development of adapted sectoral framework conditions. Further information about the KfW Credit Bank for Development's waste management work can be found at: http://www.kfw-entwicklungsbank.de/EN_Home/Sectors/Waste_management/index.jsp.

The GIZ has been providing advice on legal, organisational and technical solutions for around 30 years in the field of waste management. The project entitled "Promotion of mechanical biological waste treatment", for instance, investigated how the technology applied in Germany could be adapted to operate in other countries to reduce greenhouse gas emissions from landfill. Other measures to reduce and recover waste have been actively pursued by the GIZ to reduce climate change. GIZ work is focused on three key fields of action at a local municipal level:

- improvement of residential hygiene by basic disposal,
- environmental and climate protection by waste avoidance, waste recovery and proper disposal and
- ensuring cost-covering and socially acceptable financing by the perpetrators of the waste

For more information refer to:

<http://www.gtz.de/de/themen/umwelt-infrastruktur/abfall/3966.htm>.

4.1.2 CDM /JI Initiative

The flexible mechanisms of the Kyoto Protocol, such as Clean Development Mechanism (CDM) and Joint Implementation (JI) projects, have the potential to bring about greater climate benefits in developing and emerging countries, as well as in other industrial countries, than in Germany on the assumption that the available financial resources are limited. CDM and JI projects are also possible in the waste management sector, providing the host countries regard waste management measures as an integral part of their climate protection and sustainability strategy.

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety has used the CDM/JI Initiative (www.jiko-bmu.de) in recent years to expand its cooperation with host countries for CDM and JI projects. Networks have been set up to overcome investment barriers and promote the lasting involvement of German companies in the host countries of the CDM and JI projects. This creates capacity in the host countries and sectors that have been neglected to date, such as waste management as well as transport and households, are opened up for CDM.

The CDM/JI Initiative has been implemented in recent years in close collaboration with the German Society for International Cooperation (GIZ). The initiative therefore benefits from the promising GIZ structures and working methods that have been set up during its long-term cooperation with the host countries.

A key measure for promoting the export of waste management knowledge and expertise and modern waste management solutions was the development and publication of the "Guide to the Utilisation of the CDM in Waste Management, Guidelines for Investment Projects Abroad". It can be obtained at <http://www.jiko-bmu.de/service/-download/doc/843.php>. The guide is accompanied by a comprehensive portfolio of information on the waste management situation in over 45 countries. These country profiles can also be called up on the CDM/JI Initiative website at www.retec-germany.net.

4.2 Action 3-2 "Promote Technology Transfer and Environmental Education"

4.2.1 Federal Ministry for the Environment's Advisory Assistance Programme

The Advisory Assistance Programme initiated by the Federal Ministry for the Environment, is supporting countries in Central, Eastern and Southeast Europe, as well as countries in the Caucasus region and Central Asia, in their efforts to drive forward climate protection. The new EU member states and the EU pre-accession states receive selective support in the adoption and implementation of the European Union's environmental legislation. The Russian Federation too is a key partner state in terms of environmental cooperation. The advisory programme is run by Germany alongside the "Environment for Europe Process" (EfE)²³ and the environmental strategy for the successor states of the Soviet Union agreed by the Environment Ministers of the United Nations Economic Commission for Europe (UNECE).

The advisory programme was set up at the start of 2000 and financing of 2.24 million euros was available annually, although this has risen to 2.74 million euros since 2010. Approximately 30 or so projects are started every year, running over several years and on a broad range of subjects; there are currently 50 projects up and running. The Federal Environment Agency is responsible for the management of the programme on behalf of the Federal Ministry for the Environment and works with project partners from the worlds of business and science and with NGOs from Germany and abroad.

An overview of the advisory assistance projects is available in the International Environmental Protection project database (www.umweltbundesamt.de/ius/database.php).

4.2.2 RETech Initiative

The Federal Ministry for the Environment has assumed overall control for the setting up of the RETech Initiative (www.retech-germany.net) to support German companies and institutions to exploit this potential. Together with a network of key players from the worlds of business, administration and universities, the RETech Initiative aims to raise waste management standards abroad, improve the stage of development of waste management in emerging and developing countries and optimise support and networking for German technology export and know-how transfer companies. The RETech Initiative is also intended to contribute to making exporters' activities at national and state level more transparent, better coordinated with each other and more efficient.

The services covered by the RETech Initiative encompass:

- recycling, disposal and consultancy services from the waste management sector

²³ The "Environment for Europe Process" was initiated in 1991 to improve the environmental situation in the transformation countries by means of closer cooperation with states in Central and Eastern European, the Caucasus region and Central Asia.

- machine and plant manufacturers of waste and recycling technology (incl. supplier industries)
- local authority and private decision-makers and investors abroad
- German and foreign universities and research institutions

A *University Atlas* at www.retech-germany.de includes a comprehensive database of German universities and research institutions in the recycling and waste management sector. The atlas enables companies to use search fields to locate universities or independent research institutions that have specific areas of expertise or are pursuing international cooperation in a specific country.

4.2.3 Cleaner Production Germany

Cleaner Production Germany (CPG) is an internet portal run by the Federal Environment Agency providing comprehensive information about the performance of German environmental technology and environmental services. CPG makes available, for example, information about national and international financing tools and contacts in the field of technology transfer.

The portal is an in-depth information source for presenting and communicating German environmental expertise and assists German and foreign environmental technology agents make contact with each other for the purpose of cooperation and business relations. The portal lists more than 2,500 different articles with qualified summaries for ease of orientation and provides information about 1,500 detailed practical examples of the state of the art. Users have the option of selecting information and best-practice examples from 30 technology sectors. 3R technology makes up a significant proportion of the practical examples.

4.2.4 Environmental Technology Atlas

In 2009 the Federal Ministry for the Environment produced a new edition of the Environmental Technology Atlas: "GreenTech made in Germany 2.0". The Environmental Technology Atlas is based on a survey of around 1,300 environmental technology companies and 200 research institutions in Germany and focuses on six lead markets for the future: environmentally-friendly energy generation, energy efficiency, raw material and material efficiency, recycling, sustainable water management and sustainable transport. The atlas charts the "green tech" sunrise industry and examines the potential and capability of environmental technology in Germany, in the individual federal states and in the key international global markets (USA, Japan, Brazil, Russia, India, China). The Environmental Technology Atlas is available online at http://www.bmu.de/wirtschaft_und_umwelt_umwelttechnologie_umwelttechnologie-atlas/doc/38674.php.

4.2.5 Twinning Projects

"Twinning" is synonymous with "partnership". Since 1998 the Federal Government has been supervising 78 environmental twinning projects. The total volume of these projects amounts to approximately 76 million euros and the aim of the EU-financed programme is to support EU accession states and pre-accessions states in adopting and applying EU legislation and setting up the institutions needed for this. Experts from authorities in the EU member states

are sent for one to two years to partner authorities in the accession and pre-accession states. The focus to date has been on the fields of waste management, air and water quality, avoidance of industrial pollution, plant safety and the financing of environmental investment projects.

In addition to the IPA (Instrument for Pre-Accession Assistance (EU pre-accession states and the Western Balkans), the EU has actively extended its twinning programme to countries that are not directly EU pre-accession states with ENPI (European Neighbourhood and Partnership Instruments).

The EU INTERREG instrument has been increasingly used since 2008 for cross-border cooperation. In projects in the Baltic Sea region and in Central Europe running until 2012 the focus is on sustainable biomass production and its use to support climate protection and environmental innovation. The total volume of these projects is approximately 16.4 million euros.

4.3 Action 3-3 " Cooperation with Stakeholders"

4.3.1 Environmental Information Act

After freedom of access to information on the environment had initially been regulated in Directive 90/313/EEC (OJEU L 158, P. 56) of the Council of the European Community of 7 June 1990, the European Community signed the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters on 25 June 1998, also known as the Århus Convention.

On 14 February 2005 the *Act on the Restructuring of the Environmental Information Act* and on the amendment of the legal bases for emission trade of 22 December 2004 came into force. For the first time, authorities had a duty to publish all of the "environmental information that is important for their work." It also clarified that the term "environmental information" also includes environmentally-related aspects, such as health, safety and activities and measures that have an impact on the environment. Furthermore certain non-state organisations²⁴, over and above local authorities, now also have a duty to provide information. The processing period is generally one month or two months following submission of the application due to the complexity/scope. It is only possible to request environmentally-relevant information that is provided in various forms taking into consideration appropriate fees. Access to non-environmentally-related information is guaranteed by the general *Federal Freedom of Information Act* of 5.09.2005 (Federal Law Gazette I P. 2722).

The duty of local authorities and other entities in the federal states and municipalities to provide information has to be regulated in the relevant federal state legislation and that has now been done in all 16 federal states.

²⁴ According to § 2 Article 1, "natural or legal entities under private law, providing they exercise public work or deliver public services, relating to the environment, in particular those of general interest to the environment, and thus are governed by the control of the Federation or a legal entity under public law supervised by the Federation" are deemed to be bodies with a duty to provide information.

4.3.2 German Environmental Information Portal

The German environmental information portal – PortalU (<http://www.portalu.de>) – has been online since 2006 as a jointly operated online portal, replacing GEIN, the German Environmental Information Network. PortalU, the German environmental information portal, and the Environmental Data Catalogue (UDK) have been operated, developed and managed since then by the coordinating organisation *Umweltportal Deutschland*. The German Environmental Information Portal provides a central access point to over 2.4 million websites and over 500,000 database entries from more than 340 public institutions and organisations in Germany. Its aim is to offer a fast and reliable overview of all of the relevant public information on the environment. The active dissemination of information on the environment and the verification of information on the environment by metadata play a key role in this. The metadata from the Environmental Data Catalogues from the Federal Government and states consolidated in the PortalU is passed onto Germany's Geodata Infrastructure project (GEI-DE) within the framework of the EU Directive 2007/2/EC. PortalU is thereby contributing to the setting up of a European geo-infrastructure along the lines of INSPIRE.

5 Summary and Outlook

The *Kobe 3R Action Plan* from 2008 for the first time operationalised the 3R Initiative started by the G8 states in 2004 in the form of a structured framework of goals. If the three goals and the actions assigned to them are superimposed over Germany's waste management policy, it can be seen that there is in fact a high level of compliance and achievement.

A significant number of the proposed actions have already been implemented in Germany before 2008 in the form of concrete measures. In turn, with regard to others, their origin, for instance in the form of a draft bill, can also be dated back to before 2008, although the implementation or publication in the Federal Law Gazette only took place between 2008-2011. Some regulations implement in national legislation European Union directives or ordinances, many of which came about thanks to the efforts of Germany.

With the advanced version of the draft of a revised *Act for Promoting Closed Substance Cycle Waste Management*, Germany is making a further important step towards a waste economy characterised in particular by a high degree of resource efficiency.

An important task in the coming years will be to implement the aims of the future *Act for Promoting Closed Substance Cycle Waste Management* by the enactment by the Federal Government of concrete ordinances. The legislature will include several parent acts for this purpose.