Green New Deal Series volume 1

GREEN EUROPEAN FOUNDATION

A Green New Deal for Europe

Towards green modernization in the face of crisis

The Greens | European Free Alliance in the European Parliament

Wuppertal Institute for Climate, Environment and Energy

The Green European Foundation is the political foundation of the aisbl GEI.
This publication has been realized with the financial support of the European Parliament.
The European Parliament is not responsible for the content of this project.

English language editing: Jacki Davis, Geoff Meade - Meade Davis Communications
Production: Micheline Gutman

Printed on Cocoon 100% recycled paper

Published by the Green European Foundation - aisbl GEI, October 2009
Printed in Belgium, 2009

ISBN/ EAN: 978-94-90-51500-3

This publication can be ordered at:
Green European Foundation - aisbl GEI, 15 rue d'Arlon, 1050 Brussels, Belgium
Phone: +32 2 234 65 70 I Fax: +32 2 234 65 79
E - mail: info@gef.eu I Web: www.gef.eu

Green New Deal Series volume 1

A Green New Deal for Europe

Towards green modernisation in the face of crisis

A report by the Wuppertal Institute for Climate, Environment and Energy

Authors:

Dr. Philipp Schepelmann

Marten Stock

Thorsten Koska

Dr. Ralf Schüle

Prof. Dr. Oscar Reutter

Wuppertal Institute
for Climate, Environment
and Energy

This report was commissioned by:

The Greens | European Free Alliance
in the European Parliament

Published by:

GEF
GREEN EUROPEAN
FOUNDATION

Acknowledgements

Special thanks are owed to the four reviewers: Prof. Dr. Raimund Bleischwitz, Dr. Susanne Böhler, Prof. Dr. Manfred Fischedick, Prof. Dr. Peter Hennicke, and Dr. Stefan Thomas at the Wuppertal Institute for Climate, Environment and Energy. Thanks, too, to Joachim Denkinger and his team for their professional management of a productive dialogue between the authors and MEPs of the Greens and the European Free Alliance as well as their dedicated staff at the European Parliament. We would also like thank the European Green Foundation for supporting this work. Last but not least we would like to thank the two proofreaders Jacki Davis and Geoff Meade, who did a careful and extremely fast job in correcting our continental EUnglish.

Wuppertal, September 2009

Message from the publishers

By publishing this study commissioned by the Greens/European Free Alliance (EFA) Group in the European Parliament and carried out by a research team at the Wuppertal Institute for Climate, Environment and Energy, the Green European Foundation (GEF) demonstrates its ambition to contribute to the dissemination of ideas and research on the necessary transformation of contemporary capitalism. A transition towards more sustainable and equitable patterns of production and consumption is needed not only inside each of our societies, but also between the different regions of the world.

The financial crisis of 2007-2008, in all its length and intensity, has shaken (at least provisionally) a significant number of what previously seemed to be 'certainties' and firm convictions, in particular on the respective roles of states and markets. Nonetheless, we were made to re-live a story that is only too well-known: the privatisation of profits and the socialisation of losses. In September 2009, while stock markets are recovering, unemployment is still on the rise and all the employment forecasts for 2010 predict that the labour market situation will continue to deteriorate. Is this really inevitable?

The Greens also see the economic and social crisis as an opportunity that gives credibility to and promotes both Green analyses and ensuing political priorities. The crisis rehabilitates state intervention. It calls for policies to stimulate demand, and hence for public investment, as well as determined policies aimed at creating employment opportunities. At the same time, the ecological crisis points to the scarcity of resources, the degradation of natural environments and the unsustainable Western ecological footprint.

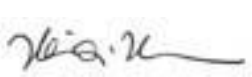
Al Gore's standing, Nicholas Stern's study and the work of the United Nations Environment Programme (UNEP) and the Intergovernmental Panel on Climate Change (IPCC), among others, have helped various actors – going well beyond the Green political family – to realise that changes in our way of life are now imperative.

During their 2009 election campaign, the European Greens put forward their proposals for a European and a global "Green Deal" – a symbolic reference to the policies implemented to recover from the Great Depression of the 1930s, a recovery which was only finally achieved after the Second World War. Obviously that is something that we must avoid repeating at all costs, but, as was the case back then, time is short. The results of the European elections, as well as the difficulties encountered within the framework of the G20 and in preparing the United Nations Climate Change Conference in Copenhagen in December 2009, prove that there is still a long way to go to convince, decide and act in the right direction.

Only one dimension of a "Green Deal" is analysed in this study: public and private investment in eco-industries, in transport and in the development of renewable energies, as well as the worldwide transfer of these technologies. The 2008-2009 recovery plans represented – and still represent – an opportunity to begin or speed up (depending on the country) a necessary and urgent change in orientation. In demonstrating the positive employment impact which would result from this change, the authors argue that while the ecological transformation of our economies certainly presupposes costs for certain sectors of the economy, it will also generate wealth and activity. Given that current policies inside the European Union – at the national as well as European level – are not ambitious enough in this respect, there is enormous potential – which is both technically and financially feasible - to build a better future.

The Green European Foundation will continue, throughout various projects and publications, to disseminate political analyses and recommendations such as the ones proposed by the Wuppertal Institute in this study. We would like to thank the authors and the Greens/EFA Group in the European Parliament for this valuable contribution.

Heidi Hautala **Pierre Jonckheer**



Co-Presidents, Green European Foundation
20 September 2009

Foreword

We are confronted with the convergence of multiple crises - economic, environment and social - which call for a global response. In the 1930s, President Franklin D. Roosevelt launched his ambitious "New Deal" to get America out of the Great Depression, the stock market crash and soaring unemployment. Today's crisis is not only economic and it can only be fought with an integrated policy approach: A GREEN NEW DEAL. This has been acknowledged as a global challenge by United Nations Secretary General Ban Ki Moon and the the UN Environment Programme (UNEP).

Seeking to overcome the economic crisis by putting more pressure on the environment is not an option, because global warming and resource depletion are already threatening our very existence. Overcoming the environmental crisis by putting the breaks on citizens' economic activities, with the risk that unemployment and poverty will soar to unprecedented heights, is not an option either. Our strategic task is to decouple economic activity, the use of resources and environmental impacts while creating sustainable and decent jobs for our citizens.

Over the past year, billions of Euros have been spent in Europe, the US and other industrialised countries on so-called 'recovery packages' to overcome the economic crisis. From the beginning, our Group called for these unprecedented amounts of public money to be used to green the economy and begin the ecological transformation of product and service markets towards more sustainable patterns.

This is not an easy task and needs 'enlightened' political strategies. That is why we approached the Wuppertal Institute to help us take stock of the current situation and identify the most suitable areas, effective instruments and best practices for promoting our Green New Deal.

The report reveals that the recovery packages launched in the European Union are lagging behind those of the United States and Asia, and it presents evidence to demonstrate the economic and employment potential of a Green New Deal. The report takes a pragmatic approach in the sense that it focuses primarily on how to 'green' immediate recovery activities in specific economic areas, and how to support the creation of framework conditions which initiate a dynamic for ecological modernisation and structural change. It also identifies key elements for the implementation of a Green New Deal.

The report shows that the EU and its Member States have many of the ingredients needed to deliver an effective Green New Deal. What is lacking is political determination and leadership. No scientific study can help overcome this. Only a political strategy that can command widespread support and puts pressure on the institutions and on political actors to change direction can do so. The case studies presented in this report show that the development of eco-industries in some Member States depends on a societal consensus regarding key aspects of sustainability and a determined government which is able to set and enforce high environmental standards.

The EU must play a leading role in orchestrating a Green New Deal, ecological modernisation and the creation of green jobs. We know that the EU has a number of targeted programmes at its disposal which have the potential to develop into central elements of such a strategy. One of our main tasks as a political group in the European Parliament will be to find ways to transform EU policies by attaching strong environmental and resource-use conditions to activities financed by the EU's Structural Funds, research programmes, recovery spending, etc.

We thank the research team at the Wuppertal Institute for the valuable work they have done within the tight deadlines we gave them. We take a lot of political inspiration from this cooperation.

Rebecca Harms

Co-president of the Greens/
European Free Alliance Group
in the European Parliament

Claude Turmes

Vice-president of the Greens/
European Free Alliance Group
in the European Parliament

Index

Acknowledgements 2

Message from the publishers 3

Foreword 5

List of figures 9

List of tables 9

Executive summary 10

1. Introduction 15

2. Comparison of recovery packages 17

2.1 The overall size of the recovery packages 17

2.2 Comparing the green share 19

2.3 Composition of the green stimulus 21

2.4 Job-creation potential 22

2.5 Overview of recovery packages 23

2.6 Intermediate result 25

3. Green New Deal and eco-industries: empirical background and expectation 27

3.1 Definition of eco-industries 27

3.2 Turnover and employment in Europe's eco-industries 29
3.2.1 Turnover of eco-industries 29
3.2.2 Employment in eco-industries 32

3.3 Example: eco-industries in Germany 34
3.3.1 Characteristics of the German eco-industries 35
3.3.2 The co-evolution of environmental policy and eco-industries in Germany 36

3.4 Economic and political drivers of eco-innovation 37

3.5 Intermediate result 38

4. Outlines of a Green New Deal in the EU 41

4.1 Strategies for a Green New Deal 42
4.1.1 Lisbon Strategy 43
4.1.2 Sustainable Development Strategy 43
4.1.3 Resource productivity as paramount indicator of a GND 46

4.2 Policies for a Green New Deal 48
4.2.1 Common Agricultural Policy (CAP) 48
4.2.2 Regional Policy 48

4.3 Programmes for a Green New Deal 49
4.3.1 The Competitiveness and Innovation Framework Programme (CIP) 49
4.3.2 The Seventh framework Programme for research and technological development (FP7) 50
4.3.3 Environmental Technology Action Plan (ETAP) 50

5. Conclusions and recommendations 53

6. Analysing the main sectors and levers for a "Green Deal" in the EU-27 57

6.1 Transport policy - problems and challenges in the European Union 57
6.1.1 Strategies for sustainable passenger transport 58
6.1.2 Existing recovery programmes in the European Union - instruments in the passenger transport sector 60
6.1.3 Profiles of key instruments in the earthbound passenger transport sector 61

6.2 Energy policy: problems and challenges in the European Union 65
6.2.1 Existing regulations and strategies 67
6.2.2 Potential and abatement costs 68
6.2.3 Strategic fields of action and employment effects 69

6.3 Resource policy – problems and challenges in the European Union 73
6.3.1 Risks and impacts of resource use 73
6.3.2 Resource productivity and competitiveness 75
6.3.3 Employment impact of resource productivity 76
6.3.4 Strategies of resource efficiency policy 76
6.3.5 Core objectives for improved resource efficiency 77
6.3.6 Resource efficiency and Green New Deal 79

References 81

List of Figures

Figure 1	Absolute volumes of selected recovery packages	17
Figure 2	Stimulus as percentage of the World GDP by Region	18
Figure 3	Ratio of green stimulus of national recovery packages	19
Figure 4	Evaluation of stimulus packages	20
Figure 5	Country specific growth of the eco-industry between 1999 and 2004	31
Figure 6	Total job creation through €75 ($100) billion in spending	39
Figure 7	Decoupling economic activity, resource use and environmental impact	45
Figure 8	Energy intensity of EU-27 in 2005	47
Figure 9	Resource productivity of EU-27 in 2005	47
Figure 10	EU-15 modal split of inland earthbound passenger transport	57
Figure 11	EU-27 modal split of inland earthbound freight transport	57
Figure 12	Greenhouse gas emissions from transport	58
Figure 13	New Passenger Car Registrations in Europe 2008-2009	60
Figure 14	Final Energy Consumption in the EU	65
Figure 15	Greenhouse gas emissions by Member State	66
Figure 16	Greenhouse gas emissions by sector	66
Figure 17	Integrated climate and energy policy of the EU	67
Figure 18	Overview of GHG emission reductions in the 30%-P&M scenario vs. BAU	68
Figure 19	Development of global resource extraction	74
Figure 20	Development of material and labour cost in the German manufacturing industry	75
Figure 21	Resource productivity versus competitiveness	76
Figure 22	EU-15 DMC versus GDP at constant prices	77

List of Tables

Table 1	Comparison of 2009 spending and GDP	18
Table 2	Country specific allocation of the green stimulus	21
Table 3	Overview of selected recovery packages	23
Table 4	EU-15 eco-industry sizes from 1999 and 2004	30
Table 5	Overview of studies and estimates conducted on the job creation potential of a green stimulus	32
Table 6	EU-15 eco-industry employment from 1999 and EU-25 eco-industry employment from 2004	33
Table 7	EU-15 country specific employment of eco-industries in 1999	34
Table 8	Drivers of eco-innovation	38
Table 9	Final energy savings 30%-P&M scenario vs. BAU	69

Executive Summary

Following the financial and economic crisis of 2008, a number of governments around the world have made a powerful contribution to active economic policy-making by launching recovery packages. Most of these packages have green elements, sometimes of a considerable size. European recovery programmes are small in relative and absolute terms, especially compared to Asian programmes, but we can nevertheless expect strong global statedriven demand pushing green markets.

The real impact of the green stimulus of recovery packages remain to be seen. Discussions about actual sizes, measures and even additional packages are in many cases still ongoing. Comparing the green share of recovery programmes is often difficult, not least because there is no general consensus on which measures are supposedly green. This is one of the main reasons why Europe needs a clear vision of what a Green New Deal is all about.

Many studies and commentaries on the green share of recovery programmes focus on climate and energy issues, but a Green New Deal comprises – and should comprise – more than an answer to climate change. It needs to promote eco-industries with a clear vision of a green modernisation of the economy.

Based on the Eurostat/OECD definition of eco-industries, we define a Green New Deal as targeted state investment in activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes innovation in cleaner technologies and products and services that reduce environmental risk and minimise pollution and resource use.

In the EU, eco-industries already generate a considerable turnover and employment. Different studies confirm excellent potential for further growth. They also show that this is unevenly distributed within the EU. Therefore, successful innovation and industry policies by the market frontrunners could be a model for the active diffusion of eco-innovation in all EU Member States.

Support for eco-industries alone is not enough, because even green economic growth can be harmful, if it merely contributes to increasing an already unsustainably high level of natural resource consumption. Thus, a Green New Deal needs to be more than a technology platform for eco-industries. It has to be guided by a vision of what a green modernisation of industry should look like in the long run. A Green New Deal requires structural change on all policy levels to achieve three objectives. It should:

1. Break up unsustainable structures
2. Build up sustainable structures
3. Give the right mid- to long-term orientation

A Green New Deal should meet these objectives at the strategic level, at the level of individual EU policies and at the programming level.

Strategies

At the strategic level, there is a lack of a long-term guiding vision of sustainable production and consumption patterns beyond low carbon. The green parts of the Lisbon Strategy combined with the Sustainable Development Strategy contain elements which could be used as central building blocks of such a vision. In particular, the huge gap in energy and material productivity between EU Member States (up to a factor of 8!) should become the central challenge for guiding (eco-innovation) policies. This requires support for efficiency frontrunners and technological leapfrogging in regions with low resource productivity. This would enable the EU to harvest a double-dividend of decreased pressure on the environment (including CO_2 emissions) and increased competitiveness due to the reduction in production costs. Thus the EU would set itself on a development path which would eventually lead towards consumption and production patterns respecting ecological boundaries in Europe and beyond.

Policies

Major EU policies could boost the resource efficiency of EU industries and infrastructure by combining EU and national funds. In particular, with the Cohesion Policy, the European Union has a funding system dedicated to structural change which is already operating on a similar scale to the green stimulus in European recovery programmes. By combining national recovery programmes with EU Regional Funds, the EU Member States could create the necessary financial leverage to change production and consumption patterns, especially in regions which are

lagging behind. For this purpose, the European Parliament could initiate special fast-track financing mechanisms. Such mechanisms would give a "green light" to green structural interventions to increase the resource productivity of industry and infrastructure, monitored by EU Structural Indicators on energy and material efficiency.

Programmes

Short-term Community support for a Green New Deal could be followed up by more consolidated medium-term action to integrate the necessary components of an appropriate policy mix. This could be achieved through improvements at the programming level. The EU has a number of sophisticated innovation programmes which are already contributing to a greening of the EU economy (e.g. ETAP, CIP). Different EU programmes affecting eco-innovation would have to converge and should be strengthened with Cohesion Funds for improving overall resource productivity (energy and materials). Integrated schemes for using RTD, innovation and regional development programmes could be the financial foundation for developing, at the European and regional level, a "triple-helix" consisting of stakeholders from enterprises, the public sector, research and teaching who could drive and create a self-sustaining market for improving resource efficiency in the European Union.

Priority areas for bringing about a regional transformation could be sustainable mobility, as well as energy and material efficiency.

Sustainable Transport Policy

Improving the sustainability of transportation is not only a key challenge in fighting climate change and other environmental problems. As an important sector in modern economies, more efficient and sustainable transport systems contribute to economic growth. Thus, the integration of sustainable transport investments in European recovery plans can provide important stimuli for economic growth and employment.

When it comes to political strategies and social and economic conditions, freight and passenger transport are quite different, as are earth-bound and plane or ship transport. Thus, this paper concentrates on describing problems and solutions in the field of *'earth-bound'* passenger transport.

A sustainable policy for passenger transport should focus on three basic strategies:

1. Reducing the need for transport.
2. A shift to more sustainable modes of transport.
3. Increasing the efficiency of vehicles and the traffic flow.

With respect to the sustainability of measures, a hierarchy of these three strategies can be introduced.

Reducing the need for transport is a top priority, as it allows mobility to be maintained while reducing the kilometres travelled. This notion of mobility is defined by the capacity to carry out different human activities such as business, work, purchase, leisure and other social and cultural activities. An integrated policy of transport and spacial development is therefore necessary, and this requires long-term development. Thus it is not the focus of recovery packages that concentrate on quick results.

A second strategic aspect of sustainable mobility concerns the way in which the remaining transport needs are satisfied. The different modes of earth-bound transport – walking, cycling, buses, trains and cars – have different environmental advantages and disadvantages. It is reasonable to support zero-emission mobility over short distances, and train and public transport (by bus or tram) over medium-range or longer distances. This includes the provision of infrastructure and interconnections to promote intermodality, the purchase of vehicles, mobility management, and the provision of information, education and services. These act as pull-factors for a modal shift. Push factors should also be introduced: speed limits, low-emission zones or congestion charges, eco-taxes on fuel and higher motor vehicle taxes for gas guzzlers are examples of measures that help to level the playing field for more sustainable modes of transport.

The third strategic pillar is improving the efficiency of transport. This includes measures relating to vehicle technology as well as intelligent traffic management systems and eco-driving. Policy instruments in this field include emission limits, fiscal measures to integrate the external costs of transport and R&D programmes. The latter two are possible parts of a Green New Deal.

In summary, the following possible elements of a Green New Deal can be identified:

- investments in new public transport vehicles – buses, trams and regional trains;
- investments in infrastructure for bicycles and pedestrians which are realisable in the short term;
- investments in infrastructure improvements for public transport;
- investments in services to make public transport more user-friendly;
- incentives for retro-fitting cars and public transport vehicles;
- fiscal measures to subsidise high-efficiency vehicles;
- research on energy-efficiency technologies;
- marketing of more sustainable modes of transport;
- education about eco-driving.

Sustainable Energy Policy

An EU Green New Deal will have a greater long-term impact on emission reductions and employment if it is embedded in a coherent policy mix at EU, Member State and regional level.

Four main strategic fields can be identified:

1. *Energy performance of buildings (residential, tertiary, and industrial buildings; existing buildings; new buildings; heating and cooling systems, including the use of renewable energies; smart metering)*

In the buildings sector, *a new consultancy scheme* should be launched to issue service vouchers for homeowners and SMEs. Additional direct grants for retro-fitting existing buildings should promote renewable energies and high energy efficiency standards. Additional pilot projects for passive- or zero-emission houses need to be launched to improve the performance of the existing stock of buildings. Intelligent combinations of high energy performance standards for the *buildings themselves* and renewable energies are required to reduce energy consumption and emissions from the buildings sector significantly. A Green New Deal should support cities and regions to develop zero-emission zones or zero-emission cities. For new buildings, 'energy-plus' houses provide an example for new building standards in general. The integration of low emission strategies with resource efficiency in new buildings requires further external financial support (e.g. BREEAM, CASBEE, Effinergie, DGNB and LEED). Supporting reductions in the energy consumption of heating and air-conditioning systems can also contribute significantly to reducing emissions. Old and inefficient heating sytems need to be replaced or modernised. Energy-efficient engine technology, for example, can reduce the electricity used by circulation pumps and fans by up to 80%.

2. Energy use of electrical appliances

The market penetration of energy-efficient appliances is still at a very low level. More measures are needed to support reductions in the energy consumption of office, communication, and entertainment appliances in both stand-by and on-mode. The following measures are recommended:

- support programmes for the most energy-efficient white appliances;
- support programmes for office, communication, and entertainment appliances without a stand-by facility and with low on-mode consumption.

3. Emissions in industrial processes

An EU Green New Deal should support a combination of voluntary agrements with financial incentives (e.g. tax deductions). A combination of free or subsidised energy audits (consultancy and audit vouchers); regional and/or sectoral networks and sectoral energy schemes (as, for example, in North Rhine-Westphalia); energy services; and targeted financial support programmes to promote end-use - for example in the sectoral networks or schemes - appears to be the most successful policy-mix for stimulating energy efficiency.

4. Electricity Grids and Smart Metering in the EU

Recent EU regulation, especially the Directive on energy end-use efficiency and energy services (ESD), has clearly emphasised the role of smart metering systems. A European Green New Deal should support the development and implementation of smart metering systems in order to:

- create awareness among consumers about energy consumption, energy costs and greenhouse gas emissions;
- motivate consumers to monitor energy consumption and to take additional action;
- decrease the running costs of metering and billing;
- create the technical basis for managing peak demand and integrating renewable energy sources.

More widespread use of smart-metering systems also requires a flexible European electricity grid. The structure of the European grid needs to be adapted to general developments in the energy supply market, the integration of large decentralised renewable supply systems, and the integration of large-scale offshore wind and concentrated solar power plants. Only innovative and smart grid technologies will be able to manage these strategic challenges and realise the potential for greater energy conservation. Additional funding should focus on EU-wide distribution and transmission infrastructure.

Sustainable Resource Policy

Europe is highly dependent on a wide variety of natural resources from domestic sources as well from other parts of the world. Rising global demand from emerging economies will increase resource prices and the risk of limited access to resources. Therefore, a strong economic argument for resource efficiency is the significant potential for cost reduction, with two major effects: improved competitiveness and job creation. Resource productivity could therefore be a core element of a Green New Deal, which could not only deliver short-term results but also a stronger economy overall.

Official Eurostat figures reveal a wide resource-efficiency gap between EU Member States of up to a factor 17. The EU could realise considerable environmental and competitive advantages if it systematically addressed the internal resource productivity gap. This would entail promoting the existing resource policies of the frontrunners and leap-frogging strategies for regions which are lagging behind.

In the long-term, resource efficiency has to be embedded in a more comprehensive vision of a sustainable use and management of natural resources, which may be characterised by four paradigmatic and complementary perspectives:

1. A resource-efficient and recycling-based industrial sector
2. A steady stocks society, in which the material growth of the economy will be superseded by a dynamic equilibrium between construction and deconstruction
3. A solar economy using the natural energy supply from the sun; and
4. A balanced bio-economy based on the sustainable use of biological resources.

On a pragmatic and short- to mid-term basis, there are five core objectives for the first paradigm of a resource-efficient and recycling-based industry:

1. Sustainable markets for the future
2. Strong institutions
3. Resource-efficient products and services
4. The Government as consumer – role model and market power
5. Changes in people's thinking.

To have a short-term impact on economic development and job creation, the combined creation of a European Resource Efficiency Agency (EREA) and national Resource Efficiency Funds (REF) could be an adequate strategy in the Green New Deal.

The EREA would initiate international cooperation and communication to raise awareness in Member States and industry in order to stimulate demand for consultancy services. Awareness of the cost-reduction potential among decision-makers in industry would lead to an increased demand for specific resource-efficiency technologies, products and services. The desired long-term effect would be a self-sustaining competition to obtain the cost advantages of resource efficiency in the EU's manufacturing industry.

The national Resource Efficiency Funds would finance resource efficiency, especially in SMEs, which often lack sufficient capital and expertise to introduce resource efficiency measures. The national REFs could co-finance EU Regional Funds.

Resource-efficient public procurement could be an additional instrument to support resource efficiency directly. Public institutions should start to improve procurement procedures and assets by investing in resource-efficient products and services.

1. Introduction

The world is in crisis. An unprecedented breakdown of the financial sector hit the globe in 2008. Whole economies are being rocked by unemployment and financial instability threatens the social and economic stability of the European Union.

At the same time, the natural environment is changing on a global scale. Climate change, declining biological diversity and dwindling natural resources are an increasing threat to the development of societies.

How can EU policy-makers and other actors rescue our economies and the natural environment? Can we only safeguard our economic wealth at the expense of nature? Is there an alternative of striking a Green New Deal which would at the same time boost economic development, create jobs and decrease pressure on the environment? Could Europe emerge stronger and more sustainable than it was at the start of the current economic crisis?

This study presents research results on economic recovery packages and their potential for contributing to a Green New Deal. It proposes a greening of the economy and presents evidence of its economic and employment potential. Against this background, it considers short- to mid-term political strategies and instruments in the European Union and provides recommendations for a Green New Deal in the EU.

The study focuses primarily on immediate recovery activities and supporting framework conditions, which are currently being launched throughout the world. Therefore it identifies some elements of a new "green" policy mix, but does not attempt to outline comprehensive reforms to green the economy. Long-term fiscal reforms, or fundamental shifts to a steady-state economy and other more profound changes will be needed eventually to allow for sustainable development in the European Union, but they are not the subject of this study. A Green New Deal has to take a pragmatic approach to immediate recovery plans, but it should nevertheless initiate some first steps in the direction of ecological modernisation and structural change. A Green New Deal will therefore not be a complete strategy for ecological modernisation, but it could help Europe to emerge stronger and more sustainable than it was before the current crisis.

2. Comparison of recovery packages

Soon after the beginning of the economic crisis, governments around the world recognised that the state would have to compensate rapidly dwindling private investments with large recovery packages. The world has turned away from previous *laisser-faire* approaches and towards more a proactive role for the state. Recent studies have tried to compare different packages. This research has often been based on preliminary government information about the different recovery packages that were often still in the making. Often unclear explanations of the terms of reference and differences in methodologies have resulted in a range of different assessments. Based on various studies, the following section contains basic information about the total sizes of the recovery packages, their composition and potential.

2.1 The overall size of the recovery packages

According to a first overview by HBSC (2009), the absolute size of the recovery packages which have been launched recently varies considerably (figure 1).

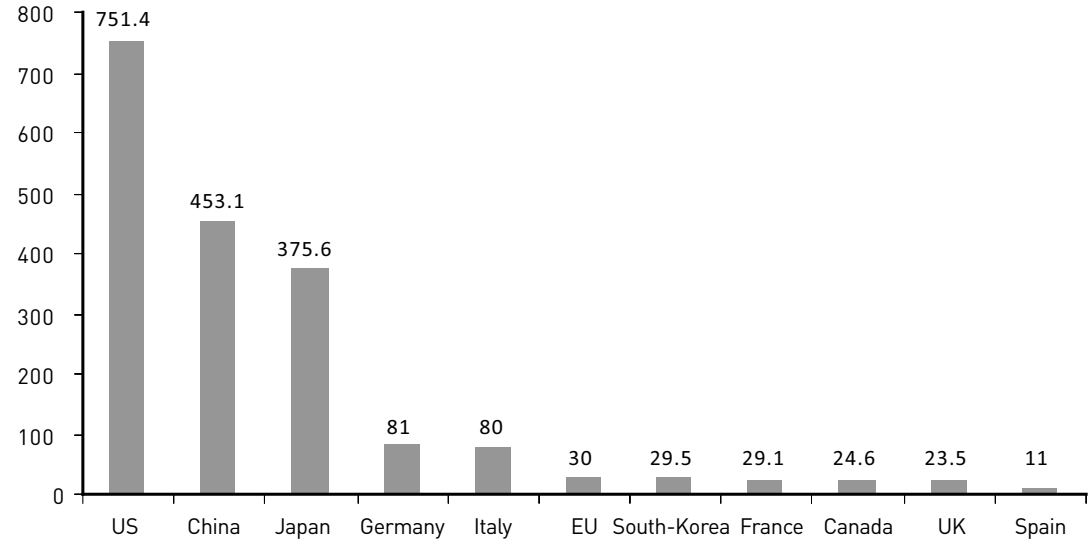


Figure 1 Absolute volumes of selected recovery packages in bn€ (based on HSBC 2009)

Most recovery packages are still in the process of development and ratification. Thus their actual size and the exact financial details are still changing. More recent studies from OECD (2009) give different absolute sizes for the packages. For instance, those of Spain and Canada are significantly higher, at €56.8 bn and €61.6 bn.

A relative comparison taking into account the different sizes of countries' economies might be more meaningful. Comparisons of figures are problematic, because the different packages often have different timespans. A comparison which takes into account the size of economies and the timeframe can be found in Saha and Weizsäcker (2009). They estimated the amount of stimulus spending in 2009 in the EU, the US and in China in relation to GDP as shown in Table 1.

In relation to its GDP, the US is spending exactly twice as much than the EU in 2009, while China's recovery package is almost eight times larger.

	bn€	%GDP
EU	112.5	0.9%
USA	199.6	1.8%
China	233.1	7.1%

Table 1 Comparison of 2009 spending and GDP (Saha &Weizsäcker 2009, p.5)

A comparison of total stimulus spending in different regions of the world in relation to global GDP underlines the relatively small size of the European packages. As shown in figure 2, Europe makes the third largest contribution to bringing the global economy out of crisis. It is twice as large as that of Near/East and Africa, one-third of US spending and less than one-third of the Asian/Oceanian effort.

The Nobel Prize laureate Paul Krugmann concluded at a press conference in Brussels on 17th March that the European stimulus packages are not sufficient by far to fight the crisis (Strobl 2009).

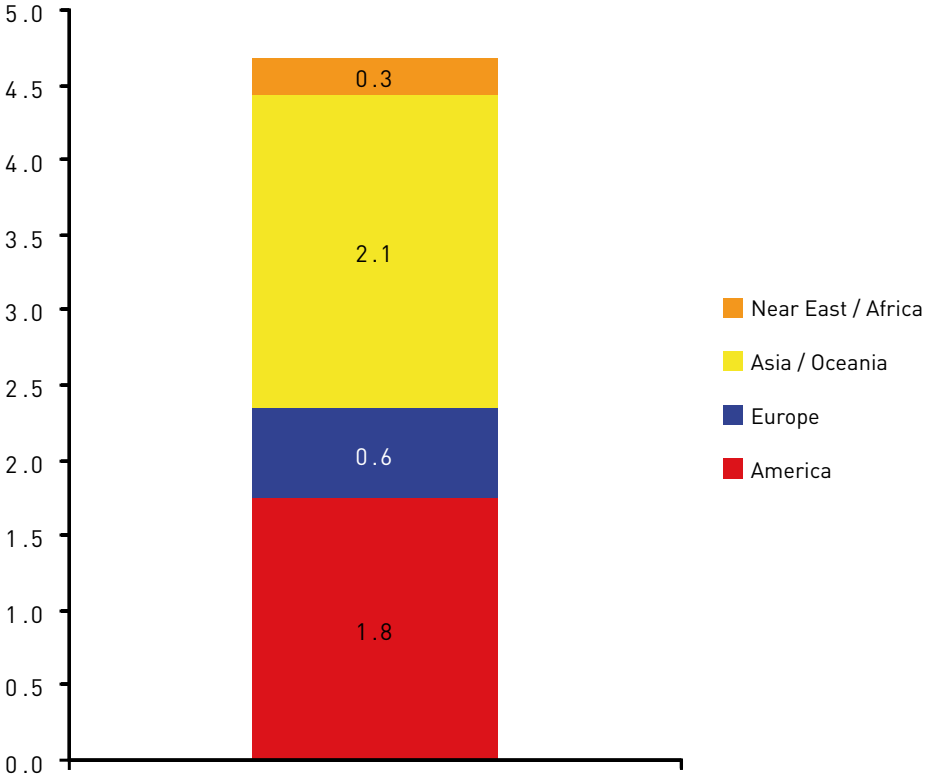


Figure 2 Stimulus as percentage of the World GDP by Region (Deka Bank 2009, p.4)

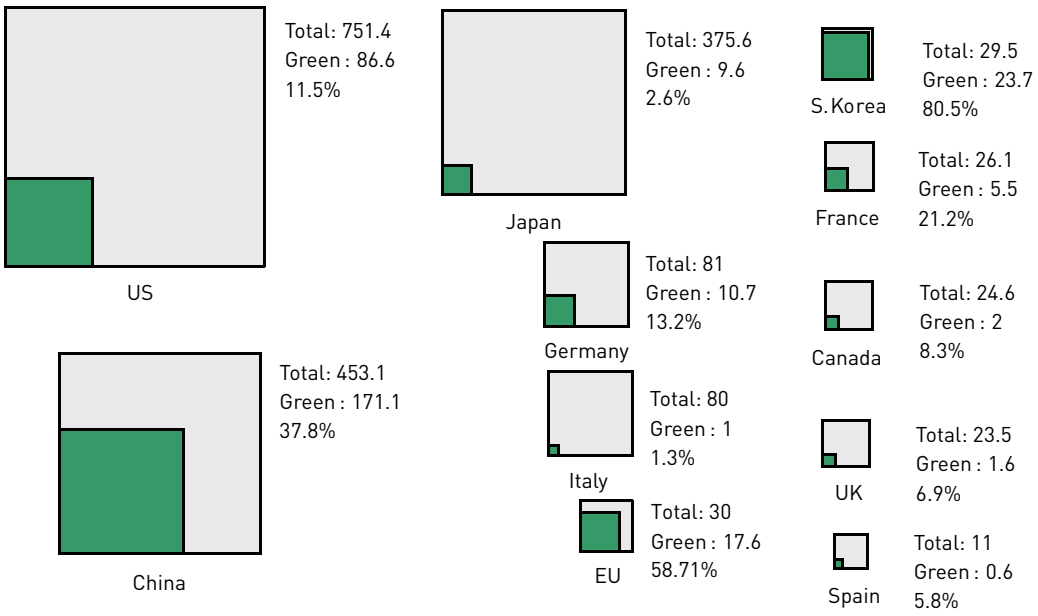


Figure 3 Ratio of green stimulus of national recovery packages, absolute volumes in bn€ (based on Bernard et al. 2009; data from HSBC 2009)

2.2 Comparing the green share

In addition to their overall size, the green share of the recovery plans also varies considerably, ranging from 1.3% in Italy to 80.5% in South Korea, as shown above.

HSBC (2009) defines green stimuli as spending under 18 themes identified by the HSBC Climate Change Index. Its study covers low carbon power, energy efficiency, water/waste and pollution control. "Green" refers to *"a sizeable slice of fiscal stimulus plans allocated to launching a low-carbon recovery"* (HSBC 2009, p.1).Bowen et al. (2009) have proposed a green share of total stimulus packages in the order of an average of 20%. This would result in a rough figure of some €300 bn of public spending annually. This is in line with McKinsey & Company (2009), who estimated that €320 bn a year until 2015 will be needed to put the global economy on a low-carbon trajectory.

With the exception of France and the European Commission, the green element in EU Member States' and the US' stimulus packages is lower than the proposed 20% share. In contrast, China and South Korea are far ahead, with shares of 37.8% and 80.5% respectively. However, it needs to be stressed that the green share of a stimulus package does not indicate how green overall government spending is.

UNEP (2009) identifies an emerging consensus among the international community on a global Green New Deal. In the coming years, large public investment programmes should be implemented in order to achieve the aims of reduced carbon dependency, job creation, environmental protection and a reduction in world poverty. According to the UN Environment Programme (2009), the current amount of green stimulus in the national recovery plans of the G20 governments is not enough by far.

Most studies on the green stimulus do not consider the quality of green spending. Usually, they can only produce estimates based on government information as to whether the measures are green or not. In addition, recent studies do not take into account ambivalence or counter-productive elements in the proposed activities. The US package, for instance, includes spending €21 bn on new roads, which will result in increased car emissions (Harvey 2009). Supposedly green measures can also be ambivalent or debatable. For example, Canada has declared support for the nuclear industry as "green" (HSBC 2009). Another example is the German so-called "environmental bonus". Owners of cars more than 9 years old get a financial bonus for scrapping their vehicles, if they buy a new car which meets a minimum emission standard of Euro 4. The risk that the new car could consume more fuel (if people switch from small to bigger cars) and/or that additional emissions and

material flows could result from the production of the new car, are often not considered. Thus, the "environmental bonus" for cars could have a negative effect in the long run in terms of emissions and material flows (T&E 2009). In comparison with environmentally targeted bonus systems, the existing schemes have already resulted in considerable lost opportunities (see box page 60).

A study by Ecofys & Germanwatch (2009) seeks to introduce a qualitative dimension to the evaluation of the green stimulus. They claim that the effect of each dollar spent varies significantly depending on what it is invested in and the way it is spent (directly or indirectly). They define effectiveness factors for each area of investment and policy instrument. The effectiveness factors for each area are defined by several qualitative criteria such as the short-term emission-reduction potential. Counter-productive measures such as road building are indicated as a negative credit.

So far only a few recovery packages have been evaluated, with the results illustrated in figure 4.

The *weighted* spending is expressed as a share of a country's GDP. The negative and positive calculations with coefficients have created different absolute volumes for each country. Nevertheless the study provides an idea of the differing quality of green spending.

For instance, Germany and the US have positive green spending of about 0.5% of their GDP, while the US has counter-productive spending totalling about 0.12% and Germany 0.05%. In the case of Italy, counter-productive spending (about 0.68%) exceeds positive green spending (0.02%).

Ecofys and Germanwatch (2009) conclude that the share of green stimulus is not big enough. *"Stronger leadership is needed from the US and larger EU economies to set a positive example for other countries"* (ibid, p.5). According to the study, the current stimulus packages do not protect the climate sufficiently, even as an addition to regular climate policy.

In general, it should be stated that the green part of the programmes is mainly focused on climate protection and does not recognise resource protection in a broader sense and the connected economic driving forces and benefits. This is understandable because climate protection should obviously have a high priority and the economic benefits of climate mitigation technologies (e.g. end-use energy efficiency, combined heat and power generation and renewables) are evident. It is quite clear that, on the one hand, short-term investment impulses can only intensify long-term climate mitigation options. On the other hand, the tremendous increase in the price of many raw materials (not only oil) before the crisis should have been taken as a signal that ecological modernisation should include not only climate protection but also resource protection as a whole. This holds true especially from an economic perspective, because materials as a share of overall industry costs and thus their economic vulnerability to global prices shocks from non-energy raw materials (especially metals) may be as high as from energy prices.

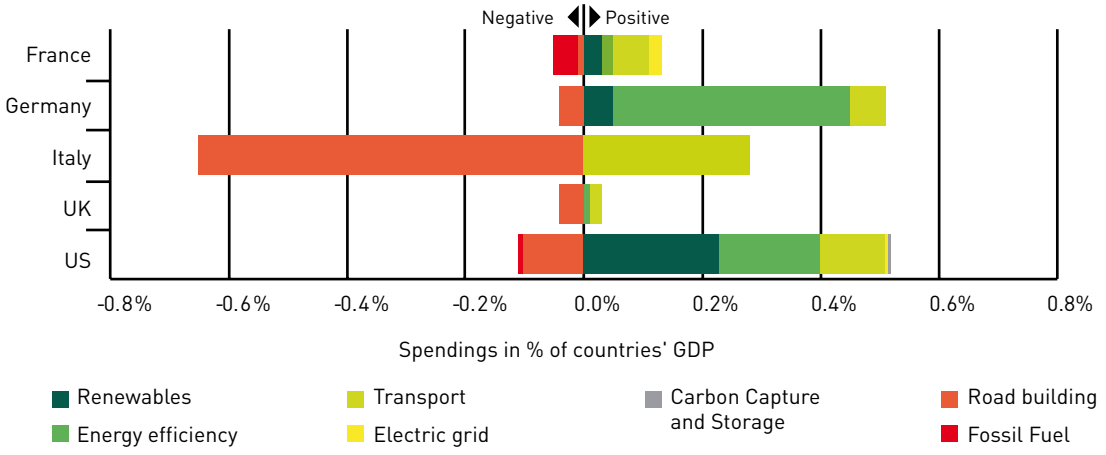


Figure 4 Evaluation of stimulus packages (Ecofys & Germanwatch 2009, p.5)

Therefore, failing to foster resource productivity through green recovery packages or to harvest the broader economic benefits connected with an integrated strategy to increase energy and material efficiency is a lost opportunity.

Looking at the carbon emission reduction potential of the recovery packages, the German IFW Institute (2009) concludes that 13% of the worldwide recovery packages dedicated to climate protection will result in global CO_2 emission reductions of 111 million tonnes per year. This is less than 0.5 percent of global emissions. IFW (2009) claims that the reduction potential of several national packages is rather limited. China, for instance, is investing more than €130 bn in its rail and energy grid, which is more an extension of capacity than an improvement in efficiency, thus resulting in increased emissions. Although China has the second biggest recovery package, its reduction potential is only 22.8 million tonnes of CO_2 per year. By comparison, the European recovery packages contribute to reducing annual CO_2 emissions by 22.4 million tonnes using much less money. The US packages have created a reduction potential of 45.7 million tonnes per year (IFW 2009). This high figure might also be due to significant investments in low-carbon power production (see 2.3).

2.3 Composition of the green stimulus

HSBC (2009) has calculated the allocation of green funds to the low-carbon power, energy efficiency and water/waste sectors, as shown in the table below.

Energy efficiency measures receive the greatest share of funds with €220.03 bn (67%), followed by the water treatment sector with €66.84 bn (20%) and low-carbon power with €43.46 bn (13%). This is in line with the global climate change policy census which identified energy efficiency measures as being the most important area for action up to 2020 (European Commission 2009). McKinsey (2008) supports these findings by identifying the highest reduction potential (14 Giga tonnes CO_2 equivalent per year in 2030) in the energy-efficiency sector. Among the energy-efficiency measures in the framework of recovery programmes, support for rail transport has the biggest share. This is primarily due to the high level of Chinese investment (€76.26 bn).

Ecofys & Germanwatch (2009) argue that measures often only focus on energy efficiency in buildings and cars. Other important sectors and emerging lead markets like renewable energies, combined heat and power, smart grids, energy storage and public transportation are not sufficiently considered (Ecofys & Germanwatch 2009; Hennicke et al. 2008).

				Low Carbon Power		Energy Efficiency				Water/ Waste	Total
Country	FUND €	Green €	%	Renewable	CSS/ Other	Building	Low Carbon Vehicles	Rail	Grid		
EU	30.0	17.61	58.71%	0.50	9.66	2.20	1.50			3.75	13.86
Germany	81.0	10.69	13.20%			8.03	0.53	2.13			10.69
France	26.1	5.52	21.19%	0.67		0.64		1.01	3.19		8.71
Italy	80.0	1.02	1.28%					1.02			1.02
Spain	11.0	0.64	5.85%							0.64	0.00
UK	23.5	1.63	6.94%			0.22	1.07	0.32		0.02	1.61
US	143.0	14.07	9.84%	7.92	2.01	2.58	0.59	0.26	0.71		14.78
	608.4	72.70	11.95%	17.42	3.05	21.18	3.09	7.41	8.50	12.04	69.16
Canada	24.6	2.03	8.27%		0.83	0.19		0.30	0.61	0.10	2.54
China	453.1	171.07	37.76%				1.16	76.26	54.11	39.54	185.65
Japan	375.6	9.61	2.56%			9.61					9.61
South-Korea	29.5	23.72	80.55%	1.39		4.79	1.39	5.42		10.74	12.99
Total	1885.7	330.33	17.52%	27.91	15.55	49.44	9.33	94.13	67.13	66.84	330.62
				43.46			220.03			66.84	

All currencies converted to €. €1=$1.29

Table 2 Country specific allocation of the green stimulus in bn € (based on HSBC 2009)

Indeed, support for renewable energy schemes is rather weak. Only France, the US and South Korea have allocated funds to this. Germany is not mentioned mainly because its renewable energy sector is already benefiting from exciting schemes like retro-fitting programmes and feed-in-tariffs (HSBC 2009). In 2008 and 2009, Germany has spent about €850 million on alternative heating and buildings. According to McKinsey (2008), low-carbon energy supply also has a high reduction potential (12 Giga tonnes CO_2 equivalent per year in 2030).

The available data suggests that only the EU, the US and Canadian packages invest in carbon capture and storage (CCS). Canada also supports nuclear power, which it considers to be a low-carbon technology (HSBC 2009).

Water and waste-related spending includes funding for general environmental improvements like the €39.54 bn allocated to this by China. The US and South Korea also contribute significantly, while Europe has allocated only minor funding to this area.

2.4 Job-Creation Potential

In general, the job-creation potential of the different stimulus packages is difficult to estimate, because it depends on various assumptions. This holds true for calculating (net) employment effects in general and for the results of existing studies. For example, sometimes only the gross effects are calculated in studies on renewables, without subtracting the job losses in traditional energy production. Many studies do not include the indirect impact of macroeconomic multipliers of additional investment (or cost reductions). Other studies only look at additional costs and do not calculate, for example, the additional tax revenues (self-financing effects) generated by state investment programmes. For strategies aimed at resource productivity (energy and material efficiency) in particular, it is not only the additional costs of investments that matter but also the macroeconomic effects of cost reductions and alternative spending of the money saved on raw materials. As a rule of thumb, existing studies suggest that about 100 net jobs can be created by reducing energy consumption by one TWh. Therefore, the direction of macroeconomic impacts (net jobs, additional growth and tax revenues) of resource protection strategies is well-established, but the induced quantity and substitution effects (e.g. direct and indirect rebound effects) of efficiency strategies are often forgotten and deserve much greater recognition in further research.

The short-term studies on very recent economic recovery developments do not allow for in-depth assessments, let alone the necessary econometric modelling. Nevertheless, a few attempts have been made to assess the job-creation potential of different programmes, although in most cases only gross effects are described:
Germany: According to a study by the German Institute for Employment (IAB) no less than 250,000 jobs can be saved through the German stimulus plan (FAZ 2009).
France: A job-creation potential of 80,000-110,000 is estimated, offset by the possible loss of 90,000 jobs (HSBC 2009).
UK: 350,000 jobs can be saved and gained in the low-carbon sector (HSBC 2009).
Canada: An estimated 407,000 jobs can be created (HSBC 2009).
South Korea: A total of 960,000 jobs are envisaged, mainly through green spending (HSBC 2009).
US: In total, the stimulus package aims to create and save 3,500,000 jobs in the US (DB Advisors 2009).

2.5 Overview of recovery packages

	Content	Fund (bn€)	Time Aspects	Green Stimulus	Green Funds (bn€)
EU	Infrastructure projects (trans-European transport projects, high-speed Internet); employment support initiative (including for the low-skilled, apprenticeships, training, reduction of social charges, etc.); investment in R&D, innovation and education; access to financing for business; reduction of administrative burdens and promotion of entrepreneurship; increase in climate change energy security investments; improvement of the energy efficiency of buildings; and promotion of "green products" and the development of clean technologies for cars and construction.	30.00	Announced Date: 26th Nov. 2008 Timing: 2009-2010 Status: Passed	Renewable Energies; Gas and electricity interconnectors; Carbon Capture and Storage; R&D for renewable energies; Energy efficiency in public buildings; Green cars initiative; Factories of the future initiative; Infrastructure services	17.6 (58.71%)
France	Mainly investment in public enterprises (post, energy and railways), defence, investments in strategic areas (sustainable development and clean technologies, higher education and research and the digital economy); investment for regional and local authorities (in partnership investment in hospitals, childcare facilities and other social institutions); support to employment, housing, the financing of firms (in particular SMEs), health and some measures for the environment. Special measures targeted at the automobile sector.	26.10	Announced Date: 10th Dec. 2008 Timing: 2009-2010 Status: Passed	Renewable energies; Sustainable agriculture; Building efficiency; Low-carbon vehicles; Rail	5.5 (21.2%)
Germany	Infrastructure (particularly schools and universities, also measures to foster broadband); measures to help business and households retain employment and overcome the crisis (secure funding, governmental guarantees, reduction of non-wage labour costs, income tax cut and means to ease burden on households – e.g., payment for children); training an upgrading grants (raising levels of education); fostering innovation and R&D; green technologies. Special measures targeted at the automobile sector.	81.00	Announced Date: 5th Nov. 2008 Timing: 2009-2010 Status: Passed	Building efficiency; Low-carbon vehicles; Modal-shift: Public transport	10.7 (13.2%)
Italy	Stimulating investments on infrastructures and research (including broadband); supporting low-income households (tax cuts for poorer families and pensioners); reducing the tax burden for SMEs; focus on greening the automobile sector and support for methane systems and the purchase of ecological cars.	80.00	Announced Date: 28th Nov. 2008 Timing: 2009 onwards Status: Passed	Modal-shift; Low-carbon vehicles	1.0 (1.3%)
Spain	Tax cuts; spending on public works and other stimulus measures to raise employment rates; liquidity to credit strapped companies (especially SMEs) and households (families, in particular); special help to the automobile sector and modernising of basic industries such as transportation, energy, services and telecommunications; and modernisation of the public civil service.	11.00	Announced Date: 27th Nov. 2008 Timing: 2009 Status: Passed	Low-Carbon Power; Energy efficiency	0.6 (5.8%)
UK	Cut in value-added tax rate; acceleration of capital investment projects (likely to include some research infrastructure) and for accelerated roll-out of broadband; credit line and loan guarantees (in particular for SMEs); and measures to combat unemployment (e.g. paying companies to hire and train the unemployed).	23.50	Announced Date: Nov. 2008 Timing: 2009-2012 Status: Pending	Building efficiency; Modal-shift: Rail and waterways; Low-carbon vehicles; Flood defences	1.6 (6.9%)

	Content	Fund (bn€)	Time Aspects	Green Stimulus	Green Funds (bn€)
US	Direct relief to working and middle-class families (tax credit, expansion of unemployment insurance, state fiscal reliefs, etc.); large infrastructure investments (roads, public transit, high speed rail, smart electricity grid and broadband); protecting health care coverage of citizens and modernising the health sector (including its computerisation and digital health records); increased funding for key scientific and engineering agencies; modernisation of classrooms; laboratories and libraries; and fostering renewable energy production and investments.	143.00 608.40	Announced Date: 3rd Oct. 2008 Timing: 10 years Status: Passed Announced Date: 15th Jan. 2009 Timing: 10 years Status: Passed	Renewable energies; Carbon Capture and Storage; Building efficiency; Low-carbon vehicles; Modernisation of the electricity grid; Environmental restoration; Flood protection; Navigation infrastructure; Water projects	14.1 (9.8%) 72.7 (12.0%)
Canada	Investments in roads, bridges and public transport, investments in clean water as well as in knowledge and health infrastructure (including post-secondary institutions, research equipment, digitisation of health records, extension of access to broadband services and green energy infrastructure); investments in the renovation and retrofit of social housing and support for home ownership and the housing sector; personal and business tax relief; access to financing, support and training to citizens affected by the crisis; and support to most affected sectors and communities (e.g. targeted funding for the auto, forestry, agriculture, and manufacturing industries).	24.60	Announced Date: 27th Jan. 2009 Timing: 2009-2013 Status: Pending	Low-Carbon Power (CCS and atomic energy); Energy efficiency; Waste and water infrastructure	2.0 (8.3%)
China	Low-income housing; rural infrastructure; water; electricity; transportation; the environment; technological innovation and rebuilding after disasters such as earthquakes. Support package to auto and steel industries.	453.10	Announced Date: 9th Nov. 2008 Timing: 2009-2010 Status: Passed	Low-carbon vehicles; Rail-Infrastructure; Electricity grid; Biological conservation; Environmental protection	171.1 (37.8%)
Japan	Support for household consumption; tax reductions on mortgages; benefits for dependent persons; cutting of healthcare costs; creation of new public-sector jobs in nursing, retirement homes and childcare, and jobs relating to the protection of the environment; raising the self-sufficiency ratio of food; funds on a priority basis to research in advanced technologies and related research; and reduction of taxes for eco-friendly cars.	375.60	Announced Date: 19th Dec. 2008 Timing: 2009 onwards Status: Passed	Tax cuts of investment in energy saving and new energy equipment	9.6 (2.6%)
South-Korea	Focus on sustaining green technology and value-added services to build new engines of growth (including sustainable energy, technologies to reduce greenhouse gas emissions, information technologies as well as healthcare and tourism).	29.50	Announced Date: 6th Jan. 2008 Timing: 2009-2012 Status: Passed	Renewable energies; Building efficiency; Low-carbon vehicles; Modal shift; River and forest restoration; Medium sized dams	23.7 (80.5%)

Table 3 Overview of selected recovery packages. All currencies converted to €. €1=$1.29 (HSBCS 2009; OECD 2009, p. 22-23)

2.6 Intermediate result

Primarily based on the evidence presented, we may conclude that the overall size of EU recovery packages is low in comparison to the US and Chinese plans. European programmes contain a small green share compared to the Asian programmes, but it needs to be stressed that there is insufficient evidence on the quality of green spending. Nevertheless, the low level of green stimulus in the EU, especially compared with Asian programmes, is remarkable and might raise questions about global leadership in the ecological modernisation of the global economy.

The studies which have been published have been short-term assessments reflecting recent and short-term developments. Often, many aspects of the recovery packages could not be considered sufficiently. The recovery packages are being phased over different timespans. For instance, the US recovery packages cover a period of 10 years, while those in France have a two-year timeframe.

Furthermore, many aspects of the recovery packages have still not been decided. Discussions on actual sizes, measures and even additional packages are still ongoing. Therefore, the terms of reference for each study should have been made clear, which has not always been the case.

Another difficulty lies in identifying the green share. First, it is not always clear which measures are designed to be green and, second, the differing quality of the measures in relation to stimulating new green lead markets are not considered.

Nevertheless, the data and references are accurate enough to conclude that the total size and the green share of the European recovery packages is small in relative and absolute terms.

Many studies and commentaries on the green share of recovery programmes only focus on climate and energy issues, but a Green New Deal comprises – and should comprise – more than strategies for climate protection. For example, China, South Korea and the US dedicate substantial funds to waste and water treatment. Waste and water treatment are typically clean-up industries reacting to environmental pollution after it has occurred (end-of-pipe). Especially with regard to competitive EU industries in the waste and water sector, these traditional environmental technologies should not be neglected. In emerging economies, the lack of environmental infrastructure is already creating large and growing markets (ECOTEC 2002; Schepelmann 2006).

It should be recognised that, on the one hand, traditional end-of-pipe technologies create new business fields, revenues and jobs in supply industries and national economies, but raise costs in the industrial sector which applies these technologies. On the other hand, integrated production and product policies reduce costs, but deficits in official statistics and comprehensive modelling make it more difficult to calculate the macroeconomic effects.

Combining end-of-pipe solutions with integrated process and product policies in terms of energy and material efficiency could enable the EU to put its stamp on this attractive market. Beyond climate change, a European Green New Deal will have to address all aspects of green industries. The following chapter outlines the turnover of and employment in eco-industries in Europe, and concludes by describing the economic and political drivers of eco-innovation in Europe.

3. Green New Deal and eco-industries: empirical background and expectations

New Deal policies are usually connected to stimulating demand through government spending. The previous chapter has shown that a Green New Deal means stimulating public demand in "green" economic sectors (e.g. energy, waste and water management). Eventually, this leads to additional turnover, employment and innovation in these sectors of the economy. The following section therefore looks at the current turnover and employment situation in European eco-industries and concludes with an outlook on the drivers of eco-innovation.

3.1 Definition of eco-industries

OECD and Eurostat (1999) provided a broadly accepted definition of eco-industries as those engaged in *"activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use"* (ibid, p.9).

It should be emphasised that this definition focuses on ecological impacts and does not include the cost impacts of using the products of eco-industries for cost reduction, which is important to calculate the macroeconomic effects of investments.

That means that the typical statistical classification is also supply-oriented and does not indicate the different cost-effects of different technologies (e.g. of end-of-pipe or integrated technologies). Therefore, more research should be directed at the question of what industries and technologies contribute to cost reductions by avoiding unnecessary residues (e.g. waste water, heat or materials) which create only costs and no added value,

Broadly speaking, the industry can be sub-divided into pollution management, cleaner technologies and products, and resource management. These three groups consist of the following sub-sectors (ibid, pp. 10ff.):

Pollution Management
- Air Pollution Control
- Waste Water Treatment
- Waste Management
- Remediation and Clean up of Soil & Groundwater
- Noise and Vibration Control
- Environmental Monitoring & Instrumentation
- Environmental Research & Development
- Public Environmental Administration
- Private Environmental Management

Resource Management
- Water Supply
- Recycled Materials
- Nature Protection
- Indoor air pollution control
- Renewable energy plant
- Heat/energy saving and management
- Sustainable agriculture and fisheries
- Sustainable forestry
- Natural risk management
- Eco-tourism

Cleaner Technologies and Products
- Cleaner/resource-efficient technologies and processes
- Cleaner/resource-efficient products

Two major studies commissioned by DG Environment have been carried out to examine the European eco-industry. One has been published by ECOTEC (2002) for the base year 1999 and the other by Ernst & Young (2006) for the base year 2004, with the latter regarded as a five-year update of the 1999 study.

Both studies use the definition provided by OECD and Eurostat with slight variations.

Within the ECOTEC study (2002), the "cleaner technologies and products" sector is included in the "pollution management" sector. In the "resource management" sector, only the water supply, recycled materials and nature protection" subsectors have been included.

In contrast to ECOTEC (2002) and Ernst & Young (2006) and the underlying classification of OECD and Eurostat (1999), Jänicke & Zieschank (2008) have proposed including "cleaner technologies" as well as "solid waste management and recycling" in the resource management sector. Thus all applications and integrated environmental technologies would be included in resource management. According to this classification, resource management and cleaner technologies have a larger market share than pollution control and end-of-pipe technologies (Jänicke & Zischank 2009).

Jänicke & Zieschank (2008) argue that the specific contribution of eco-industry is difficult to assess if this is becoming a major trend across industry in general. This would be the case if, for example, recognising the cost-saving potential of improved resource efficiency becomes a general trend in industry. This would eventually lead to a situation in which the definition and delineation of distinct eco-industries would be superseded.

The definition used by OECD and Eurostat is not explicitly used by Berger (2008) to describe the German eco-industry, but the defined lead markets are similar to the OECD/Eurostat classification of the sectors. By contrast, Berger (2008) identifies "sustainable mobility" as an additional sector of the eco-industry, consisting of improved energy efficiency in vehicles, a fall in the volume of traffic and improved vehicle utilisation and modal split.

The employment potential of eco-industries also depends on the underlying definition. UNEP (2008) defines green jobs *"...as work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution"* (ibid, p.35f.).

Eco-innovation is defined by Reid & Miedzinski (2008) as *"the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a whole-life-cycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substances"* (ibid, p.3; see also Bleischwitz et al. 2009a).

3.2 Turnover and employment in Europe's eco-industries

The evidence presented about the size of the eco-industry can only provide a rough orientation. As described in the previous chapter, the data on eco-industries has to be interpreted with care since there is no clear delineation of this partly cross-sectoral industry.

However, past experience shows that the development of eco-industries requires political leadership, as will be demonstrated through the example of the global eco-market champion Germany (chapter 3.3.). Political action is required to defend and further develop the EU's leading role on the world market, especially in the new EU Member States.

3.2.1 Turnover of eco-industries

According to assessments made by Berger (2008), the global market for eco-industries is worth about €1,000 bn, a figure which will double to about €2,200 bn by 2020. These are only rough estimates, because eco-industries are cross-sectoral industries without statistically defined boundaries. Therefore, estimates of their total worth depend significantly on the definitions and exact empirical evidence.

The differentiation of markets and potential is often not clear, but is of the utmost importance for conceptualising a "New Green Deal". If the impressive figures on market potential imply the autonomous development of self-sustained markets, there is no need for policy interventions including a Green New Deal. If these figures are only calculations of potential, even greater potential can be identified (e.g. for energy and material efficiency) – and more promising economic benefits can be anticipated – if existing market barriers and failures can be overcome by innovative policy mixes (e.g. a New Green Deal). There is evidence that the figures cited predicting tremendous economic growth in eco-industries are estimates of potential which can only be turned into markets and new business opportunities with a "helping hand" from the state. This is important for Green New Deals in two respects: on the one hand, it emphasises the need to look into policy mixes which encourage R&D and the scaling-up of eco-industries; on the other hand, accelerated support for existing eco-industries requires additional instruments and incentive structures.

In comparison to climate mitigation policies, the European Union has still no comparable studies and results on the development of resource policies.[1] In particular, the specific key strategies, instruments and policy mixes have to be developed and the economic impacts have to be calculated by top-down and bottom-up modelling.

ECOTEC (2002) presents primarily 1999 data for the EU-15, which according to Ernst & Young (2006), comprised about 94% of the eco-industries of the EU-25 in 2004. Therefore table 4 only includes figures for the EU-15 for comparison:

1 This is why the German government has launched the large MaRess research project (Material Efficiency and Resource Conservation), in order to identify intervention points and to conceptualise appropriate policy-mixes, http://ressourcen.wupperinst.org

1999						
Country	Total Turnover (€ million)	% of EU-15	Pollution Mgmt (€ million)	% of total turnover	Resource Mgmt (€ million)	% of total turnover
Germany	56,710	31.0%	41,195	72.6%	15,515	27.4%
France	37,990	20.7%	22,330	58.8%	15,660	41.2%
UK	24,470	13.4%	17,085	69.8%	7,385	30.2%
Italy	15,980	8.7%	10,700	67.0%	5,280	33.0%
Netherlands	9,610	5.2%	7,170	74.6%	2,440	25.4%
Austria	8,900	4.9%	8,275	93.0%	625	7.0%
Spain	8,030	4.4%	5,525	68.8%	2,505	31.2%
Denmark	6,630	3.6%	5,405	81.5%	1,225	18.5%
Belgium	4,770	2.6%	2,405	50.4%	2,385	50.0%
Sweden	3,310	1.8%	2,620	79.2%	690	20.8%
Finland	2,100	1.1%	1,790	85.2%	310	14.8%
Portugal	1,750	1.0%	920	52.6%	830	47.4%
Greece	1,900	1.0%	1,045	55.0%	855	45.0%
Ireland	790	0.4%	525	66.5%	245	31.0%
Luxembourg	280	0.2%	165	58.9%	115	41.1%
EU-15 Total	183,220	100.0%	127,155	69.4%	56,065	30.6%

2004						
Country	Total Turnover (€ million)	% of EU-15	Pollution Mgmt (€ million)	% of total turnover	Resource Mgmt (€ million)	% of total turnover
Germany	66,114	30.9%	44,597	67.5%	21,517	32.5%
France	45,851	21.5%	28,264	61.6%	17,587	38.4%
UK	21,224	9.9%	12,103	57.0%	9,121	43.0%
Italy	19,269	9.0%	8,946	46.4%	10,323	53.6%
Netherlands	14,039	6.6%	10,953	78.0%	3,086	22.0%
Austria	10,091	4.7%	9,092	90.1%	999	9.9%
Spain	9,044	4.2%	6,047	66.9%	2,997	33.1%
Denmark	8,794	4.1%	6,542	74.4%	2,252	25.6%
Belgium	5,806	2.7%	2,785	48.0%	3,021	52.0%
Sweden	3,968	1.9%	3,090	77.9%	878	22.1%
Finland	3,543	1.7%	1,414	39.9%	2,129	60.1%
Portugal	2,356	1.1%	1,069	45.4%	1,287	54.6%
Greece	2,054	1.0%	1,266	61.6%	788	38.4%
Ireland	1,211	0.6%	818	67.5%	393	32.5%
Luxembourg	319	0.1%	198	62.1%	121	37.9%
EU-15 Total	213,683	100.0%	137,184	64.2%	76,499	35.8%

Table 4 EU-15 eco-industry sizes from 1999 and 2004 (based on ECOTEC 2002 and Ernst & Young 2006)

ECOTEC (2002) uses demand for environmental protection goods and services to estimate the size of the industry in the EU-15 Member States and candidate countries. According to these estimates, the eco-industries of the EU-15 supplied €185 bn of goods and services in 1999, while the pollution management and cleaner technologies sectors contributed €127 bn and the resource management sector €58 bn.

Candidate countries (CC-13) supplied €10.3 bn of goods and services a year in pollution management, on which an average share of 1.9% GDP had been spent (ECOTEC 2002).

According to the study by Ernst & Young (2006), total turnover in the EU-25 eco-industries amounted to €227 bn in 2004, with the EU-15 generating a total of €214 bn (94%). Pollution management contributed €144.9 bn and resource management €81.8 bn.

Ernst & Young (2006) stated that the turnover increased in total by about 7% in the EU-15 between 1999 and 2004 (measured in constant prices). Based on the data in table 4, this figure cannot be reproduced as information on the underlying inflation rates is missing. The country-specific growth of the eco-industry is presented in figure 5:

In terms of turnover, the largest sectors in the EU's eco-industry are water supply, wastewater treatment and solid waste management. Waste water treatment and waste management each account for about one-third of the pollution management sector (Ernst & Young 2006).

In both survey periods, 50% of the total EU-15 turnover was generated by the eco-industries of Germany and France (table 4).

Based on different classifications of the eco-industry, Jänicke & Zieschank (2008) claim that the resource management and cleaner technologies sectors have a larger market share than the pollution control and end-of-pipe technologies sectors. They underline the high growth of resource management in comparison to traditional pollution control. Jänicke & Zieschank challenge Ernst & Young (2006) because, according to them, some figures have not been included and others were estimated too low. Thus, Jänicke & Zieschank (2008) estimate the total turnover of the EU-25 to be at least €270 bn (2.6% of the GDP).

According to the German consultancy Berger (2008), the performance of Germany's eco-industry was significantly underestimated by ECOTEC (2002) and Ernst & Young (2006). For 2005, Berger estimated a significantly higher turnover of €150 bn (see

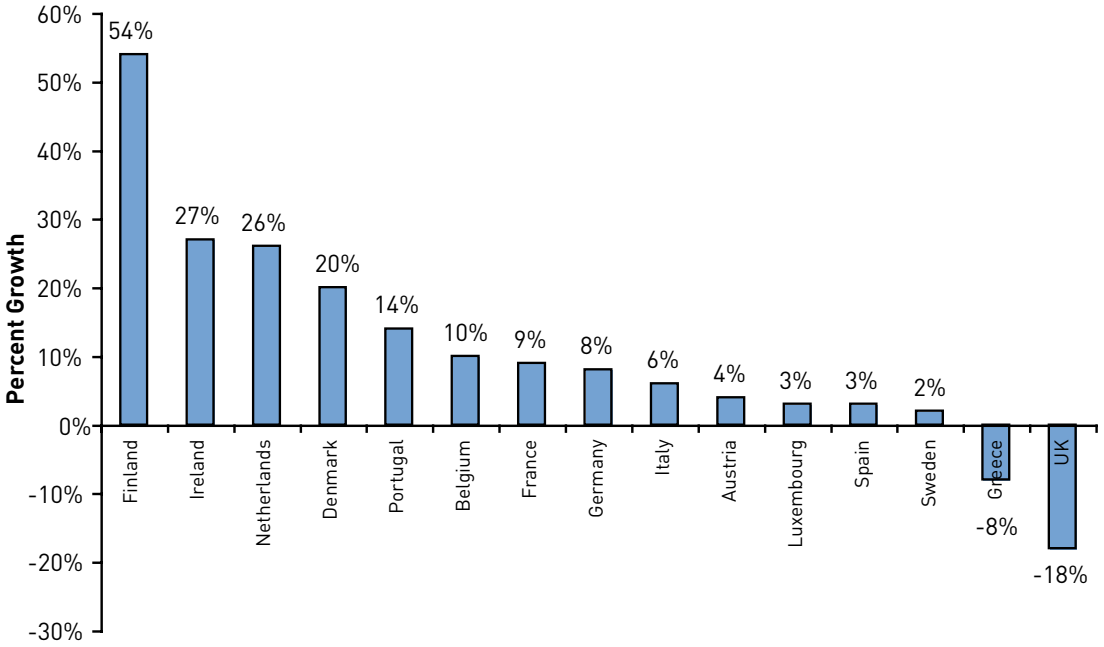


Figure 5 Country specific growth of the eco-industry between 1999 and 2004 at constant prices (based on Ernst & Young 2006)

chapter 3.3.1). Some factors are quantified by Jänicke & Zieschank (2008): for instance, a relatively high figure estimated at €40 bn for eco-construction (retro-fitting) had not been considered, nor industries like eco-tourism and green financing. In addition, the estimates for renewable energy were too low (€12.3 bn in 2004 instead of €2.2 bn). This is twice as much as the estimate for the EU-25 (€6.1 bn) (Jänicke & Zieschank 2008).

3.2.2 Employment in eco-industries

Several studies and estimations of green jobs worldwide and for specific regions have been made. To interpret these studies, the statistical difficulties in isolating eco-industries described above have to be borne in mind. In this context, it is not intended to present final quantitative data and results. Instead, the existing scattered and partly incomparable approaches are presented as robust indicators that the macroeconomic development of eco-industries is positive and promising. An overview of these studies and estimates are summarised in the following table:

According to UNEP (2008), the prospects for green employment are very positive. Wind and solar power are expected to create more than 8 million jobs within the next 20 years. Other major potential can be realised in the construction of energy-efficient buildings and the retro-fitting of existing ones, as well as moving from conventional to more sustainable farming. Furthermore, the introduction of modern public transport systems in regions where no system or only an old, inefficient one currently exists could create considerable employment. Finally, the expansion of recycling and remanufacturing measures throughout the production chain has significant potential.

More specific studies of the employment situation in eco-industries have been made on behalf of the European Commission. Ernst & Young (2006) identified about 3.4 million full-time direct and indirect employees (equivalents) in Europe in 2004, with 2.3 million jobs in the pollution management sector and about 1 million in the resource management sector. Waste water treatment and solid waste management account for about 77% of employment in the pollution management sector - some 1.77 million jobs (Ernst & Young 2006).

Source	Estimated jobs	Region examined	Timeframe	Other consideration
University of California, 2008. "Energy Efficiency, Innovation, and Job Creation in California."	1,500,000	California	1977-2007	Resulting from energy efficiency policies
	403,000	California	2008-2020	Efficiency and climate-action driven jobs taking into account the potential for innovation
US Metro Economics, 2008. "Current and Potential Green Jobs in the US Economy."	750,000	US	2006	By increasing renewable use and implementing efficiency measures
	2,500,000	US	2008-2018	By increasing renewable use and implementing efficiency measures
	4,200,000	US	2008-2038	By increasing renewable use and implementing efficiency measures
Political Economy Research, 2008. "A Program to Create Good Jobs & Start Building a Low-Carbon Economy."	2,000,000	US	Potential	Based on spending $100 billion in public funds in a "green" recovery program
Barack Obama, 2008. Energy and Economic Policies.	5,000,000	US	2008-2018	Based on $150 billion stimulus
Gordon Brown, 2008. UK Renewable Program.	160,000	US	2008-2020	Based on £100 billion stimulus
	25,000,000	Worldwide	2050	-

Table 5 Overview of studies and estimates conducted on the job creation potential of a green stimulus (DWS 2008, p. 6)

	Sector	EU-15 1999				
		Direct			Indirect	
		OPEX	CAPEX	Total	OPEX	Total
Pollution Mgmt	Air Pollution Control	30,300	80,700	111,000	50,400	161,400
	Waste Water Treatment	209,100	218,500	427,600	132,200	559,800
	Solid Waste Management	696,300	64,000	760,300	144,300	904,600
	Remediation & Clean Up	15,100	8,000	23,100	17,700	40,800
	Noise & Vibration	21,800	7,000	28,800	3,500	32,300
	Environmental Administration	66,500	9,100	75,600	26,100	101,700
	R&D	25,900	2,400	28,300	3,300	31,600
	Total	1,065,000	389,700	1,454,700	377,500	1,832,200
Resource Mgmt	Water Supply	208,800	88,100	296,900	135,300	432,200
	Recycled Materials	223,600	10,900	234,500	46,200	280,700
	Nature Protection	66,700	33,100	99,800	22,600	122,400
	Total	499,100	132,100	631,200	204,100	835,300
	Grand Total	1,564,100	521,800	2,085,900	581,600	2,667,500

	Sector	EU-25 2004				
		Direct			Indirect	
		OPEX	CAPEX	Total	OPEX	Total
Pollution Mgmt	Air Pollution Control	31,718	88,113	119,831	58,926	178,757
	Waste Water Treatment	387,547	209,245	596,792	203,355	800,147
	Solid Waste Management	774,976	68,329	843,305	165,184	1,008,489
	Remediation & Clean Up	21,176	14,763	35,939	25,026	60,965
	Noise & Vibration	20,763	9,320	30,083	3,235	33,318
	Environmental Administration	178,117	39,710	217,827	51,031	268,858
	R&D	-	-	-	-	-
	Total	1,414,297	429,480	1,843,777	506,757	2,350,534
Resource Mgmt	Water Supply	-	-	-	-	502,000
	Recycled Materials	-	-	-	-	439,000
	Nature Protection	-	-	-	-	100,000
	Total	-	-	-	-	1,041,000
	Grand Total					3,391,534

Table 6 EU-15 eco-industry employment from 1999 and EU-25 eco-industry employment from 2004 (based on ECOTEC 2002 and Ernst & Young 2006)

Figures are presented for direct and indirect employment. Further differentiations are made between employment created by spending on operations (OPEX) and investment-related expenditure (CAPEX). Indirect employment is mostly generated by spending on operations.

According to the studies by ECOTEC (2002) and Ernst & Young (2006), estimations of employment varied considerably between 1999 and 2004. Direct employment in pollution management increased from 1.45 million jobs in 1999 (EU-15) to 1.85 million jobs in 2004 (EU-25). Direct employment in resource management activities increased from 0.6 million jobs in 1999 (EU-15) to 1.04 million jobs in 2004 (EU-25).

	Direct				Indirect		Total	
	OPEX		CAPEX		OPEX			
Country	Jobs	%	Jobs	%	Jobs	%	Jobs	%
Germany	373,800	24%	128,700	25%	148,900	26%	651,500	24%
France	337,300	22%	64,700	12%	122,800	21%	524,800	20%
UK	264,100	17%	115,600	22%	85,800	15%	465,500	17%
Italy	126,500	8%	42,400	8%	46,600	8%	215,600	8%
Netherlands	84,200	5%	55,400	11%	34,200	6%	173,900	7%
Austria	90,300	6%	18,900	4%	35,600	6%	144,900	5%
Spain	72,200	5%	14,200	3%	26,100	4%	112,500	4%
Denmark	62,500	4%	18,100	3%	26,300	5%	106,900	4%
Belgium	31,500	2%	20,900	4%	11,900	2%	64,300	2%
Sweden	39,400	3%	10,000	2%	13,500	2%	63,000	2%
Finland	31,300	2%	11,100	2%	10,500	2%	52,900	2%
Portugal	24,300	2%	8,700	2%	9,000	2%	42,000	2%
Greece	16,700	1%	8,500	2%	6,300	1%	31,500	1%
Ireland	7,600	0%	3,600	1%	2,900	0%	14,100	1%
Luxembourg	2,300	0%	800	0%	800	0%	3,900	0%
EU-15 Total	1,564,100	100%	521,600	100%	581,300	100%	2,667,300	100%

Table 7 EU-15 country specific employment of eco-industries in 1999 (based on ECOTEC 2002)

Nevertheless, the results presented in these two studies should be viewed with caution because ECOTEC (2002) only presented data for the EU-15, whereas Ernst & Young provided data for the EU-25. Differences in turnover, countries' wage rates or other production factors can also have a significant effect on the model used.

A country-specific breakdown is unfortunately only supplied in the ECOTEC (2002) study, as displayed in table 7.

The German eco-industry has the highest share of employment, with almost one-quarter of the total jobs in 1999. In contrast to the results for Germany provided by ECOTEC (2002) and by Ernst & Young (2004), BMU (2005) provides figures of 1,412,400 employees in 1998 and 1,459,100 in 2002 (both OPEX and CAPEX) – more than double the amounts suggested by ECOTEC and Ernst & Young. This may be another indication of an underestimation – at least of Germany's eco-industries.

It is interesting to note that the American Solar Energy Society (ASES) and Management Information Services (MISI) are estimating a gross potential of 16 million jobs by 2030 in the renewable industry sector alone. The renewable energy sector has performed better in EU Member States, especially Germany, with more jobs created in the industry and much faster than in the US. The ASES and MISI are concerned that the US renewable energy industry will not be able to catch up with the European market without further investments (ASES & MSI 2009). Consequently, the US has already made some major investments in renewable energies. In 2008 and early 2009, it made the highest new capacity investment of $24bn – 20% of total global investments. US investment in wind energy in 2008 surpassed that of Germany, the world's former champion in wind energy capacity. In 2008, the US and the European Union both invested more in renewable energy capacities than in conventional energy capacities (Martinot et al. 2009).

3.3 Example: Eco-Industries in Germany

The evidence presented on the eco-industries' turnover and employment highlights the outstanding importance of the German eco-industry. Germany will therefore be examined in more detail in the following section. This will also shed light on the political and economic drivers of eco-innovation, which will be dealt with in chapter 3.4

and which are of central importance for a Green New Deal with a lasting impact on social, economic and environmental conditions.

3.3.1 Characteristics of the German eco-industries

According to recent assessments by the German Federal Ministry of Environment (BMU 2009a), the German environmental industry is booming and will continue to grow: 40% of all companies in the sector realised annual growth rates of 10% between 2004 and 2006. More than 5% of German industrial production consists of environmental goods. From 2005 to 2007, overall production in the eco-industry grew by a total of 27%. The strong development of the environmental industry in Germany also had an influence on the labour market. Companies in the environmental sector registered an average increase of 15% in their workforces between 2004 and 2006 (BMU 2009a).

In 2006, 4.5% of all German employees worked in the eco-industry almost 1.8 million people. Between 2004-2006, the sector generated 300,000 additional jobs (BMU 2009a).

Surveys of German eco-industry companies showed that turnover is expected to increase considerably in the coming years, especially in renewable energies and renewable resources. In the medium term (2030), the environmental industry is expected to out-perform traditional German manufacturing industries like machine and vehicle construction (Berger 2008). Germany already has a 16% share of the global trade in environmental goods and is gaining importance in global markets (BMU 2009a).

Based on Berger (2008), the following six lead markets have been identified:

• Sustainable energy production
Overall global market potential is estimated to double by 2020. Gas and steam technologies will maintain constant growth. The global market for solar thermal and photovoltaics will grow annually by about 20%. In 2020, the market for fuel cells will be ten times its current size, worth €75,000 mn. Renewable energies will see the most dynamic developments. The main focus of the industry until 2020 will be Central and Eastern Europe.

• Energy efficiency
The global energy efficiency market is the lead market, currently worth €450,000 mn and expected to double by 2020. German companies will have a 20% share of that market, with North America and industrialised European markets remaining the biggest international markets.

• Resource and material efficiency
The lead market resource- and material efficiency has the biggest share of investment in R&D. In Germany, overall resource use for production is estimated to have a reduction potential of 20% up to 2016, which is equivalent to a cost-reduction potential of €27,000 mn per annum.

• Circular economy
The global market for technologies in the waste and recycling economy is estimated to be worth €30,000 mn, growing to about €46,000 mn in 2020. German companies should have at least 25% of this market.

• Sustainable water management
The sustainable water management lead market is expected to be worth €0.48 bn until 2020, while the waste water management market is worth an estimated €12,000 mn, with high potential for further growth. Germany is the market leader, with a 40% share in the decentralised water management sector.

• Sustainable mobility
The sustainable mobility lead market is worth €0.18 bn and this can be doubled by 2020. Only moderate growth is expected in the market for fuel-efficient engines, but the market for bio fuels and exhaust gas filters is predicted to have an annual growth rate of 20% until 2020. Mature markets like traffic detection systems are expected to enjoy annual growth rates of 7% until 2020.

According to Berger (2008), the emerging Asian and East European markets will become more important. German companies are also expecting sales markets in Central and Eastern Europe to gain the same importance as West European markets. Markets in India, China and Russia will be far larger than those in North America and Japan. African sales markets will also become important for the energy efficiency market up until 2020.

3.3.2 The co-evolution of environmental policy and eco-industries in Germany

Germany is the world's leading supplier of environmental technology and services, thanks to an environmental policy shaped over generations since the late 1960s. Until now, some of the most densely populated and polluted regions in the world have been in Germany. The coal mining and steel-producing industries along the Ruhr caused serious environmental pollution, and a systematic environmental clean-up marked the start of a still-evolving "green" policy, as well as a highly competitive eco-industry in Germany (von Weizsäcker 1994, Jänicke 2003; Bleischwitz 2007).

The development of eco-industries generally depends on having a strong modern state which is able to set and enforce high environmental standards. Therefore, this industry depends on political will, commonly shared perspectives and continuous credible political efforts. In Germany, a broad environmental movement contributed to a societal consensus, which was also reflected in the different political parties. Over four decades, this broad political consensus helped to establish the necessary networks of state, industry, science and society which are needed for eco-innovation. Jänicke & Zieschank (2008) mention several examples of successful sector-specific programmes for environmental technology in Germany:

• Low-Energy Buildings
In 1998, the federal red-green coalition of the Social Democrats and the Greens established a policy to improve the energy efficiency of buildings as part of its climate programme. The approach was a combination of specific regulations and market instruments. Binding energy efficiency standards (insulation, heating systems) have been introduced. Old, existing and new buildings have to fulfil these efficiency standards. An eco-tax and market-incentive programmes have also been introduced. Fossil fuels became more expensive and financial support was given for low-energy houses by the state-owned bank "Kreditanstalt für Wiederaufbau" (Jänicke & Zieschank 2008). As a result of this policy mix and an overall increase in energy prices, the market for low-energy houses in Germany has been growing fast. Heating energy use in Germany was reduced by about 20% between 1996 and 2005 (SRU 2005). Altogether, €40 bn was invested in energy-efficient buildings in 2005 in Germany (Jänicke & Zieschank 2008).

• Fuel-Efficient Diesel Cars
In 1997, a differentiation in the car tax was introduced, which supported fuel-efficient cars with a tax bonus. Diesel engines with direct fuel injection are the only ones to meet these stricter targets. The eco-tax on fuel introduced in 1999 worked well together which this tax bonus. In 1999, diesel cars which consume of 3 or 5l/100km were launched onto the market. This led to not only to the successful establishment of fuel-efficient diesel cars, but also a decrease in fuel consumption. As a result, Germany is the lead market for fuel-efficient diesel cars (Jänicke & Zieschank 2008).

• Recycling
Increased market prices for resources have been a financial incentive to reduce the use of primary resources as well as boosting reuse and recycling. Trade in secondary resources has also become more profitable, and Germany also introduced a recycling policy in 1994, updated in 2001 to prohibit land filling without pre-treatment until 2005.
As a result, recycling rates increased and the amount of final disposal to landfill decreased from 63.5 million tonnes in 1998 to 45.7 million tonnes in 2005 (Statistisches Bundesamt 2007). Since 2000 there has been a significant decoupling of GNP growth and waste generation (Berger 2008).
In addition, emissions of green house gases have been cut (40 million tonnes CO_2 equivalent compared to 1990) mainly by decommissioning landfill sites (BMU 2006). An economic effect of the policy was a significant growth of the waste and recycling sector. The waste industry currently has a turnover of €50 bn and accounts for 250,000 jobs. Between 2004 and 2006, the recycling sector had an annual 13% growth in turnover and 9% growth in employment (Berger 2008).

• Renewable Energies
Rising oil prices and the eco-tax on fossil fuels supported the development of renewable energies. A major instrument was obligatory feed-in-tariffs for renewable electricity. These already existed in the 1990s (Electricity Feed In Act 1990), but were strengthened through the Renewable Energy Resources Act in 1998. €4.19 bn of revenues generated by fees were realised in 2005, which resulted in the 3% increase in electricity costs for households (Berger 2008, BMU 2006).

On top of the feed-in-tariffs, another financial incentive has been introduced. The "Market Incentive Programme" 2000-2004 supported investment in renewable energies with an amount of €665.4 mn. The state-owned bank "Kreditanstalt für Wiederaufbauf" (KfW) financed alternative heating in buildings to the tune of €350 mn in 2008 and an expected amount of €500 mn in 2009 (Jänicke & Zieschank 2008).

The effect of this policy was remarkable. A doubling of renewable power production from 19 to 37 TWh/a took place from 1991 to 2001. Another doubling of production to 73 TWh/a in 2006 was achieved in half that time. The growth rate is still increasing, with production rising to 86,7 TWh/a in 2007 (Jänicke & Zieschank 2008) and 58 million tonnes of CO_2 emissions were cut in 2007 (BEE 2008), making this mix of instruments the most effective in terms of climate protection (Berger 2008).

The economic effect included turnover in the renewable energy sector in 2004 of €12.3 bn. Turnover in 2007 was already €25 bn, with a direct and indirect gross job impact of 250,000 jobs (Jänicke & Zieschank 2008).

3.4 Economic and political drivers of eco-innovation

In a major study of the eco-industry in the EU, Ernst & Young (2006) identified five key market drivers for the environmental industry:

- compliance with EU and Member States' legal requirements and policy objectives such as water quality standards or a threshold for a minimum ratio of renewable energy production;
- the development of technologies and emerging new market segments or solutions, such as monitoring of new pollutants or the cleaning-up of former industrial sites;
- market incentives to enable the competitiveness of environmental industries to compare with that of conventional industries, such as fair pricing based on the internalisation of environmental externalities;
- the availability of public funding for co-financing investments in the environmental industry;
- consumer awareness of the special character of environmental products and technologies, their very existence and their benefits to consumers.

Ernst & Young conclude that *"compliance with policy objectives and legal requirements set by EU and national authorities will be the main drivers of eco-industry growth in the near future"* (Ernst & Young 2006, p. 48).

Jänicke (2008) identifies the following conditions as necessary to support environmental innovations:

- objectives that are clear, demanding and calculable;
- a combination of economic instruments like eco-taxation and CO_2 emissions trading in order to encourage a general trend, and regulation in order to realise specific innovation potential ("hybrid instrumentation");
- all phases of the innovation process have to be supported by a policy mix that also covers additional instruments such as labelling and networking.

Jänicke & Zieschank (2008) identify a combination of financial instruments such as the environmental tax reform and specific regulations like the Top-Runner-Programme in Japan as being a very effective approach for environmental innovations.

The significance of the price mechanism has been confirmed by the impact on technology of high energy prices today and in the 1970s.

A more systematic overview of the drivers of, and barriers to, eco-innovation can be found in Bleischwitz (2007) and Bleischwitz et al. (2009a). According to Bleischwitz et al. (2009a, p. 26), drivers of eco-innovation are *"specific and evident agents or factors leading to increased or reduced pressure on the environment. Barriers can be considered as those forms of marked imperfections that hinder markets from adopting eco-innovations. Both can be viewed either from the demand or supply side of eco-innovation"* (table 8).

Supply side	Technological and management capabilities
	Appropriation problem and market characteristics
	Path dependencies (inefficient production systems, knowledge accumulation)
Demand side	(Expected) market demand (demand pull hypothesis): state, consumers and firms
	Social awareness of the need for clean production, environmental consciousness and preference for environmentally friendly products
Institutional and political influences	Environmental policy (incentive based instruments or regulatory approaches).
	Fiscal systems (pricing of eco-innovative goods and services)
	Institutional structure: e.g. political opportunities of environmentally oriented groups, organization of information flow, existence of innovation networks
	International agreements

Table 8 Drivers of eco-innovation (Bleischwitz 2009 based on Horbach 2005)

Kristof and Hennicke (2009) recommend a combination of a broad range of instruments to steer eco-innovation. They propose a mix of:

- economic incentives and market-based instruments;
- a reduction in counter-productive subsidies;
- legislation;
- financing innovation;
- marketing and diffusion; and
- networking, information and education.

3.5 Intermediate result

Insufficient data and unclear definitions of the eco-industry result in rather fuzzy outcomes in studies on the current situation in the EU eco-industry.

Table 4 presents data from ECOTEC (2002) and Ernst & Young (2006). On the basis of this data, total growth of 7% between 1999 and 2004 was identified at constant prices, resulting in a rather low annual growth rate of about 1.5%. Berger (2008) cites Ernst & Young (2006) with an annual growth of 7% in the industry, which suggests a much higher growth than the figures presented by Ernst & Young (2006).

Jänicke & Zieschank (2008) have shown that ECOTEC (2002) and Ernst & Young (2006) both underestimated the size of eco-industry. They rather suggest a total EU-25 turnover of at least €270 bn in 2004 (2.6% of GDP) compared with the €227 bn identified by Ernst & Young (2006).

The true employment potential of the EU's eco-industry is difficult to assess. Major studies like that of UNEP (2008) can only present some quantitative figures and provide rough estimates. Nevertheless, findings from The Political Economy Research Institute of the University of Massachusetts Amherst (PERI 2008) suggest that investments in the eco-industry have a higher job-creating potential than other sectors: PERI argues that the greatest job-creation potential would be realised through "green" stimulus. According to their calculations, the employment-creation potential of a €75 bn green stimulus programme in the US would be 935,200 direct jobs, 586,000 indirect jobs and 496,000 induced jobs (PERI 2008). For comparison, they calculated scenarios with the same spending in the household consumption sector and the oil industry, with the results displayed in the following figure:

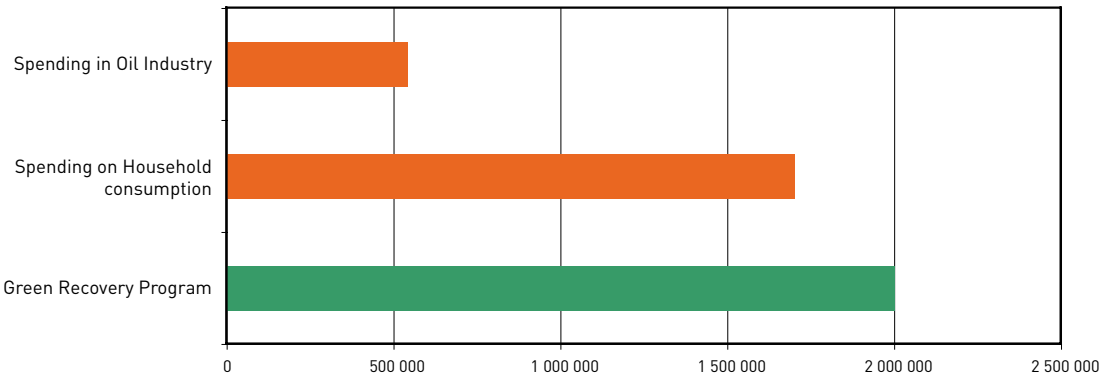


Figure 6 Total job creation through €75 ($100) billion in spending (based on PERI 2008)

Green recovery programmes apparently have larger job-creation potential than programmes which are based on measures to increase conventional household consumption (PERI 2008).

The direct job-creation effect of green investment is outlined by UNEP (2008) by analysing individual cases. For example, the construction of 6,100 compressed natural gases buses in India is expected to create 18,000 jobs (DWS 2008; UNEP 2008). Based on a study of the year 2000, the UK government assumes that for every €1 mn invested in residential energy efficiency, 11.3 to 13.5 full-time jobs have been created. A similar case study in Germany suggests that €3.8 bn of public investment and €15.2 bn of private investment in energy efficiency retro-fits resulted in about 145,000 jobs.

A more systematic assessment of the impact on employment of different Green New Deal measures would have to be based on econometric modelling. Until now, no such modelling evidence has been presented.

Turnover and jobs in eco-industries depend heavily on environmental policy. Developments in Germany have shown how continuous environmental policy can positively influence the development of a competitive eco-industry.

The most important factors for supporting eco-innovations and their dissemination are:

- ambitious policy objectives;
- binding legal requirements;
- the power and the political will to enforce legislation;
- public funding for co-financing the development and procurement of eco-innovation;
- reductions in counter-productive subsidies;
- market-based instruments;
- the capacity to develop and apply appropriate technological solutions;
- networking, information and training,

Political measures need to be launched in a synchronised way in a harmonised policy mix.

4. Outlines of a Green New Deal in the EU

Recovery packages should stimulate and stabilise the economy when private demand is lacking. A successful recovery package could achieve multiplier effects. This means that direct governmental investments could create and stimulate self-sustaining markets, leading to structural change. This multiplier effect should be used for targeted support for European eco-industries.

Definition

Based on the previous chapters, we can attempt a simple definition of a Green New Deal: it is targeted state investment in activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes innovation in cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use.

Delineation

In contrast to the definition used in other studies and commentaries, green stimuli are about more than creating a low carbon economy. They must promote eco-industries with a clear vision of a green modernisation of the economy encompassing the complete industrial system of the European Union. With a focus on short-term state investments, a Green New Deal can by no means include all the instruments needed for a green modernisation, as policies for a fundamental and long-term reshaping of society and the economy are excluded from this definition. Nevertheless, combined with a policy-mix for a short-term economic stimulus, it can pave the way for a fundamental change in consumption and production patterns. A Green New Deal can therefore be nothing more, but also nothing less, than a framework for political action to stimulate eco-innovation during the current election period from 2009-2014.

Functions

State investments in eco-industries are not enough for a Green New Deal, because even economic growth in eco-industries can be harmful if it merely contributes to increasing an already unsustainably high level of natural resource consumption. Thus a Green New Deal needs to be more than a technology platform for eco-industries. It has to be guided by a vision of what EU consumption and production patterns should look like in the long run. Therefore, a Green New Deal requires structural change on all policy levels fulfilling three functions. It should:

1. Break up unsustainable structures
2. Build up sustainable structures
3. Give the right mid- to long-term orientation.

Orientation

Our definition of a Green New Deal implies that it is a *targeted* attempt to stimulate eco-innovation. What should be the target and long-term orientation?

A Green New Deal should not create an artificial market which collapses after subsidies recede. It needs to realise potential which already exists within the European Union, which has the potential to provide guiding indicators for an ecological modernisation. Official Eurostat figures reveal a large development gap between EU Member States in terms of resource efficiency. As will be explained in the following section, the EU can gain considerable environmental and competitive advantages if it addresses the existing resource productivity gap systematically. This would entail the promotion of the existing resource policies of the frontrunners and leap-frogging strategies for regions which are lagging behind.

In addition to integrated solutions to promote overall resource efficiency in the EU, traditional eco-industries should also have a place. Regional development strategies with a combination of integrated and end-of-pipe solutions should be designed within the European Union to allow implementation of the *acquis communautaire* in combination with an increase in overall resource efficiency. Experience with these adapted strategies could also allow for improved international development cooperation, because traditional areas of environmental protection such as pollution control are very important in developing and emerging industrial economies; for example, water sanitation. According to the World Health Organization (2009)[2] *"around 1.1 billion people globally do not have access to improved water supply sources whereas 2.4 billion people do not have access to any type of improved sanitation facility. About 2 million people die every year due to diarrheal diseases, most of them are children less than 5 years of age"*. In particular, French leadership in the water treatment sector could be further developed and strengthened. In more advanced economies, a Green New Deal would be directed more towards integrated solutions and investments in resource efficiency. An ideal combination would be to integrate the notion of resource efficiency in traditional end-of-pipe technologies, for example, by offering adapted decentralised and resource-efficient water sanitation technologies.

Quick start towards resource efficiency

The European Union is a complex multi-level governance system. Political compromise is often difficult to achieve, especially when linked to a substantial allocation of funds. If the EU had to strike a fundamentally "New Deal", it is quite unlikely that it could dedicate substantial funds to this and ensure they are spent effectively within the very short timeframe of the current recovery plans. Therefore, a central strategic question is: could a Green New Deal work with the existing strategies and instruments of the European Union? What objectives, targets and timetables accompanied by monitoring mechanisms would be needed? What arsenal of research, technological and financial instruments and programmes is required?

To answer these questions, we will attempt a quick scan of central EU strategies, programmes and policies which would be affected by a Green New Deal. Thus we will not identify all of them, just central entry points for a Green New Deal:

1. **Strategies** which define the broad economic guidelines of EU socio-economic policies.

2. **Policies** which determine how the EU budget is spent on structural interventions in EU economies.

3. **Programmes** which have the potential to stimulate eco-innovation.

4.1 Strategies for a Green New Deal

A strategy is a plan of action designed to achieve a particular goal. This means that the goals are key in deciding whether EU strategies are consistent with a Green New Deal. Usually, the objectives of political strategies are quantified by indicators. To determine what kind of green deal could become part of broader EU strategies, a decision is needed on whether a Green New Deal's primary objective of stimulating eco-innovation could be measured using the indicators guiding the strategies, and if not, what indicators would have to be added or adapted.

2 http://www.who.int/water_sanitation_health/hygiene/en/index.html

4.1.1 Lisbon Strategy

The EU's paramount development strategy is the Lisbon Strategy. Adopted in March 2000 at the European Council in Lisbon, the strategy aims to make the EU the world's most competitive knowledge-based economy by 2010, with sustainable economic growth, more and better employment opportunities and greater social cohesion.

Quantitative targets and timetables complement the Lisbon vision. So-called structural indicators for monitoring socio-economic progress developed into a central instrument of indicator-based political control in the European Union to improve decision-making and assessment. In its Communication on the structural indicators of November 2000 (COM (2000) 594), the European Commission explains that the choice of the indicators was based on previous procedures. Most of the indicators had already been presented in the framework of the *Broad Economic Policy Guidelines*".

The structural indicators are used for two purposes (COM (2000) 594, p. 5):
1. Monitoring progress both in achieving the identified targets and in implementing policies.
2. Assessing the effectiveness of policies.

In its communication, the Commission admits that the first goal can be achieved rather easily, but evaluating the performance of measures will be a greater challenge, since it is based on an understanding of the relationship between action and measured results.

There is a tension between simplification and differentiation. On the one hand, indicators have great advantages (COM (2000) 594, p. 6): *"Simple and objective quantitative policy and performance indicators can play an important role in highlighting problems, measuring progress in achieving the targets identified, guiding policy makers in their policy efforts, and focusing public attention on what is at stake"*. On the other hand, the evaluation has to take place within a coherent framework to avoid over- and misinterpretation. Some data are only comparable to a very limited degree.

In March 2001, the Stockholm European Council expanded the scope of the structural indicators from purely socio-economic objectives to sustainability. In particular, the heads of state and government wanted to know about the contribution that the environment technology sector could make to promoting growth and employment – a political motivation which is obviously compatible with a Green New Deal.

In October 2001, the Commission proposed environmental indicators which were approved in December 2001 by the European Council in Laeken, enabling the Commission to present an integrated synthesis report with 42 structural indicators in 2002.

The Laeken meeting also agreed that the environmental indicators would need further refinement, so a so-called "open list" with a core set of environmental headline indicators was developed. The integrated environment indicators and the open list should be followed up in line with the political priorities of the Union. In 2003, the Italian Presidency drastically reduced the list of 42 indicators to 14. Only three indicators (instead of seven) should help to monitor the environmental dimension of the EU Sustainable Development Strategy (total greenhouse gas emissions, energy intensity of the economy, volume of freight transport relative to GDP). The three indicators chosen might not be able to reflect fully sustainable EU development, but fortunately the more differentiated list of structural indicators remains intact and can be downloaded from the Eurostat server.[3] It helps to assess many social, economic and environmental aspects of European integration both at national and EU level. This is often connected to international comparisons. Seeing "the big picture" might also be necessary with regard to the accession of socially, economically and ecologically very heterogeneous new Member States. Certainly, it could be used as an already-agreed basis for justifying central aspects of the Green New Deal.

4.1.2 Sustainable Development Strategy

The first Sustainable Development Strategy (SDS) was agreed at the European Council in Gothenburg in 2001. The objectives and principles adopted by the European Council in June 2005 form the basis for working towards effective responses to global development risks, which are described in the revised Sustainable Development Strategy.

3 http://epp.eurostat.ec.europa.eu

Most of the issues addressed in the SDS are persistent social, economic and environmental problems which require structural changes in society. Therefore, the SDS can be considered to be a long-term strategy for the EU.

The renewed Strategy adopted by the European Council addresses seven key challenges:

- climate change and clean energy;
- sustainable transport;
- sustainable production and consumption;
- better management of natural resources;
- social inclusion, demography and migration;
- fighting global poverty.

In February 2005, the European Commission adopted a set of sustainable development indicators (SDIs) for monitoring the implementation of the Sustainable Development Strategy (SDS).

Eurostat's sustainable development reporting has been influenced by the complex history of the sustainability paradigm in the EU. The SDIs are largely based on the work of a group of national experts within a so-called SDI Task Force. *"With a view to harmonisation and rationalisation, the SDI Task Force made maximum use of existing indicator initiatives, such as those of the UN Commission on Sustainable Development and OECD, the Structural Indicators, the Laeken indicators, indicators monitoring the Cardiff integration process (agriculture, energy, transport), and the core set of indicators of the European Environment Agency"* (CEC 2005a).

For grouping the total of some 155 SDI, Eurostat has proposed a multi-layer system with 3 levels:

1. The first level contains headline indicators for initial policy analysis and monitoring progress towards headline policy objectives. They are intended for high-level policy makers and the general public (see table above).

2. The second level indicators support evaluation of core policy areas and more detailed monitoring of progress in achieving headline objectives. They are constructed for policy-makers and the general public.

3. Finally, the third level is supposed to be used by a more specialised audience for further policy analysis and better understanding of the trends and complexity of issues associated with the themes or interlinkages with other themes in the SDI framework.

The Eurostat SDI and the publication *"Measuring progress towards sustainable development"* (Eurostat 2005, 2007) represent best practice in indicator-based sustainable development reporting. It is comprehensive, well-structured, intelligible and illustrated with many graphs. In the report, Eurostat assessed trends compared with policy objectives to inform the general public and decision-makers about achievements, trade-offs and failures in attaining the objectives of the strategy. The SDI framework is supposed to provide a clear and easily communicable structure for assessing policies: *"Tight policy linkages assure strong user relevance and effective utilisation of indicators in decision-making"* (Eurostat 2005, p. 9).

GDP and Decoupling

"It is not enough for us to talk about the different global challenges, as energy, climate change, health, security and the environment. We need widely accepted communication tools that show progress in these fields. And that progress can only be measured with suitable indicators. So it's time to go beyond the tools developed for the very different world of the 1930s. (...) It's time to go beyond GDP".[4]
José Manuel Barroso, President of the European Commission

"Business as usual is not an option. We do not need more and more resources and energy for a good life." [5]
Angela Merkel, Chancellor, Federal Republic of Germany

It is becoming increasingly clear to people that if the European institutions want to be serious about measuring sustainability, they need to move away from crude ratings of economies according to Gross Domestic Product (GDP), and move towards a re-definition of progress, measuring the value of products and services in relation to resource use.

4 Beyond GDP – opening speech. SPEECH/07/734.
5 Speech at the 7th Annual Conference of the Federal German Sustainability Council, November 2007.

Decoupling indicators usually set social and environmental information in relation to GDP. In the OECD report on decoupling indicators, 31 of these cover a broad spectrum of environmental issues; 16 relate to the decoupling of environmental pressures from total economic activity under the headings of climate change, air pollution, water quality, waste disposal, material use and natural resources; and 15 indicators focus on production and use in four specific sectors: energy, transport, agriculture and manufacturing (OECD 2003, Goosens et al. 2007).

The point of departure for this research project is the existing SDI headline indicator "resource productivity" for sustainable consumption and production (SCP). SCP addresses the key SDS challenges of sustainable consumption and production as well as the conservation and management of natural resources (Eurostat 2007). Resource productivity is measured by dividing GDP by Domestic Material Consumption (DMC).[6] DMC and other material flow indicators are relevant for a number of SCP policies, most notably the Thematic Strategy for the Sustainable Use of Natural Resources (COM (2005) 670). In this strategy, the relation between economic activity and resource use is at the centre of an elaborated work programme with three strategic components: (i) knowledge gathering; (ii) policy assessment; and (iii) policy integration. In the resource strategy, European Commission expects to combine the objective of improving resource productivity by decoupling resource use from economic activity with the aim of an absolute reduction in resource-specific impacts (see fig. 7).

Decoupling sheds empirical light on the often fuzzy concept of a "qualitative growth" of an economy. For example, decoupling Domestic Material Consumption (DMC) and GDP indicates that it is possible to generate economic growth by consuming fewer natural resources. Research by the Wuppertal Institute for Eurostat and the European Environment Agency indicates that (relative) decoupling is already taking place in the EU, while the European Parliament and civil society demand an absolute decoupling of economic growth and resource use (Schepelmann et al. 2006).

Decoupling is also at the heart of the OECD Environmental Strategy for the First Decade of the 21st Century, adopted by OECD Environment Ministers in 2001. In the context of SDI, the draft of an OECD guide on measuring material flow and resource productivity[7] should also be mentioned.

By complementing its economic development indicators with decoupling indicators related to energy and resource consumption (figures 8 and 9), the European Union could move towards becoming not only a competitive, but also a resource-efficient, economy.

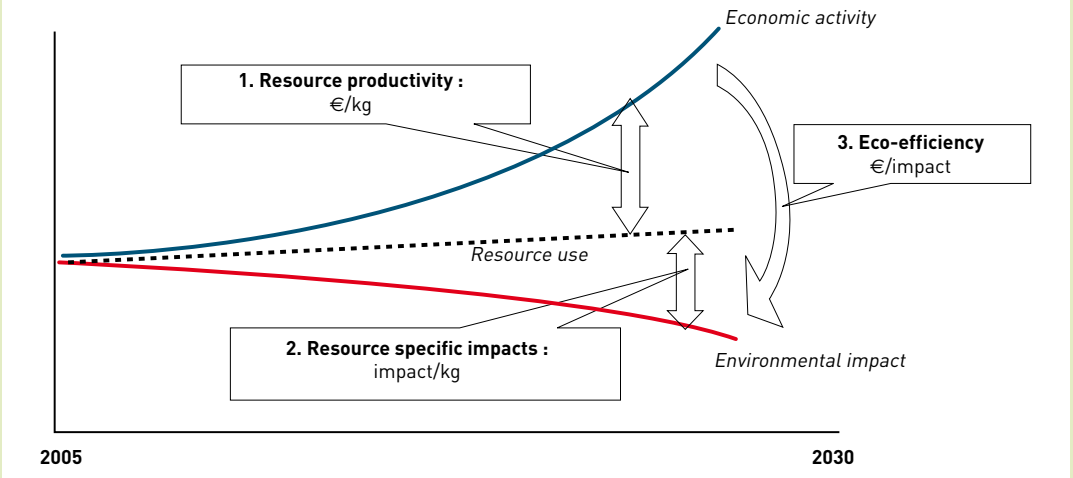


Figure 7 Decoupling economic activity, resource use and environmental impact (taken from COM (2005) 670)

6 "Domestic material consumption (DMC) measures the total amount of materials directly used by an economy. It is defined as the annual quantity of raw materials extracted from the domestic territory of the focal economy, plus all physical im-ports minus all physical exports. It is important to note that the term 'consumption' as used in DMC denotes 'apparent consumption' and not 'final consumption'. DMC does not include upstream hidden flows related to imports and exports of raw materials and products" (Eurostat 2007, p. 102).

7 OECD (2007): Measuring material flow and resource productivity an OECD guide. Draft, ENV/EPOC/SE(2006)1/REV 2, OECD Paris.

4.1.3 Resource productivity as paramount indicator of a GND

The question is whether the structural indicators combined with the SDI can be used for guiding and monitoring a Green New Deal, for example by guiding innovation policies and establishing lead markets. In fact, both indicator systems are so broad that they seem to be able to reflect sufficiently different political agendas, including a Green New Deal. In fact, their political inconsistency is one of the weaknesses of both indicator systems. *"In the same way as the Sustainable Development Strategy and the Lisbon Strategy are related, albeit covering partly different priorities and with different time horizons, the SDI and the Structural Indicators sets are responding to some slightly different needs but are also in some respects overlapping"* (CEC 2005a). This overlap is symptomatic of a weakness in the Sustainable Development Strategy (SDS) and the SDI, which indicates a lack of policy coherence. The SDS and SDI are supposed to cover economic, social and environmental dimensions of sustainable development, but so too is the Lisbon Strategy with the corresponding Structural Indicators. To improve the integration of environmental concerns in other policy areas, the Cardiff Strategy has been established, and for environmental policy, there is the Environmental Action Programme. The status of the EU SDS in between the Lisbon Strategy, the Cardiff Strategy and the Environmental Action Programme is not evident.

It is not clear why the European Union has developed both the Lisbon and the Sustainable Development Strategy with indicator systems for monitoring social, environmental and economic developments. To achieve the necessary policy coherence that a Green New Deal would require, there are three options:

- the relationship between both strategies and corresponding indicator system needs better and transparent justification; or
- one strategy and indicator system needs to be abolished; or
- both systems should be merged into a comprehensive overarching strategy and indicator system for (sustainable) social, economic and environmental development.

Thus, we may conclude that the indicator systems seem to reflect complex EU realities rather than the simplicity of single political agendas. At the same time, both indicator systems are far from perfect and need further development. To monitor the implementation of green change as a consequence of a Green New Deal, they could be further harmonised, but central issues of the Green New Deal such as modes of transport, energy and material intensity are covered by the best available data-sets of Eurostat and other European Agencies. Thus the EU has the advantage of having at its disposal a central prerequisite for a Green New Deal – a complex and highly valuable indicator system which could be used immediately for monitoring. Nevertheless, it is unclear in which direction they should guide a Green New Deal. In line with the policy areas identified in section 6, the overall guiding objectives could be:

- a reduction in the energy intensity of the EU economy;
- a reduction in the material intensity of the EU economy.

Figures 8 and 9 reveal challenging productivity gaps within the European Union.[8] Compared to average values of the EU-27, the worst performer in resource productivity is lagging behind by more than a factor of 9(!). With regards to energy intensity, the worst performer uses 6 times more energy than the EU-27 average in relation to GDP. The overall trend is that the economies of new EU Member States in particular seem to use technologies requiring much more materials and energy. In most cases, we may assume that these economies tend to waste natural resources. This decreases their competitiveness due to higher production costs. This also has negative implications in the non-productive sectors (e.g. households, for example by increasing energy bills). An overall improvement in energy and materials productivity in these economies would not only improve their performance, but would also put much less pressure on the environment. For example, most of the least productive economies rely primarily on fossil energy supplies. Thus, increasing energy productivity by a factor of four would result in CO_2 reductions of about the same magnitude.

8 For an improved comparison the indicators should be reported consistently either in intensity or productivity values.

The large productivity gap indicates the potential for technological leap-frogging strategies in regions which are lagging behind. In this context, it is important to recognise that successful technological leap-frogging depends on three factors:

1. It must be embedded in a kind of social and institutional leap-frogging concerning governance and cooperation between science, governments and business ("triple helix").

2. It should contribute to sustainable development in equal partnership between efficient and inefficient regions;

3. It should be closely connected to the *acquis communautaire* and conditional financial support.

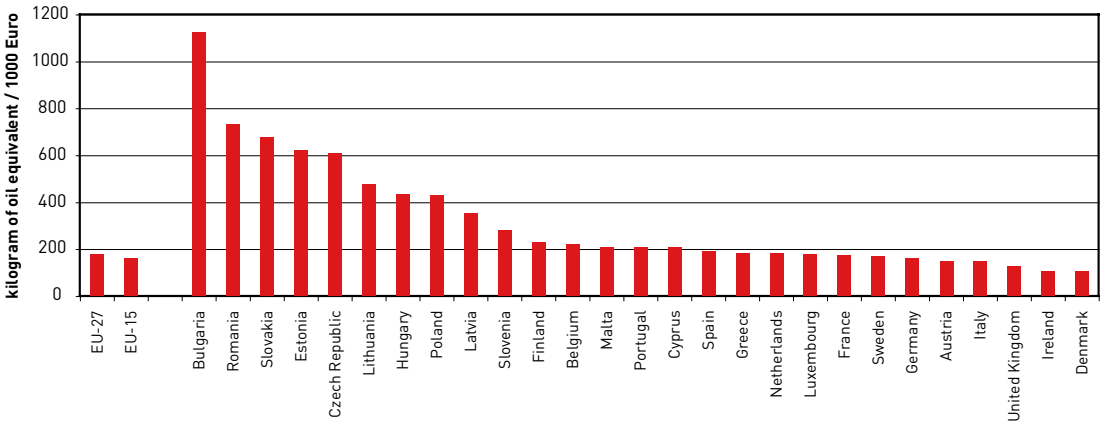


Figure 8 Energy intensity of EU-27 in 2005 (Eurostat)

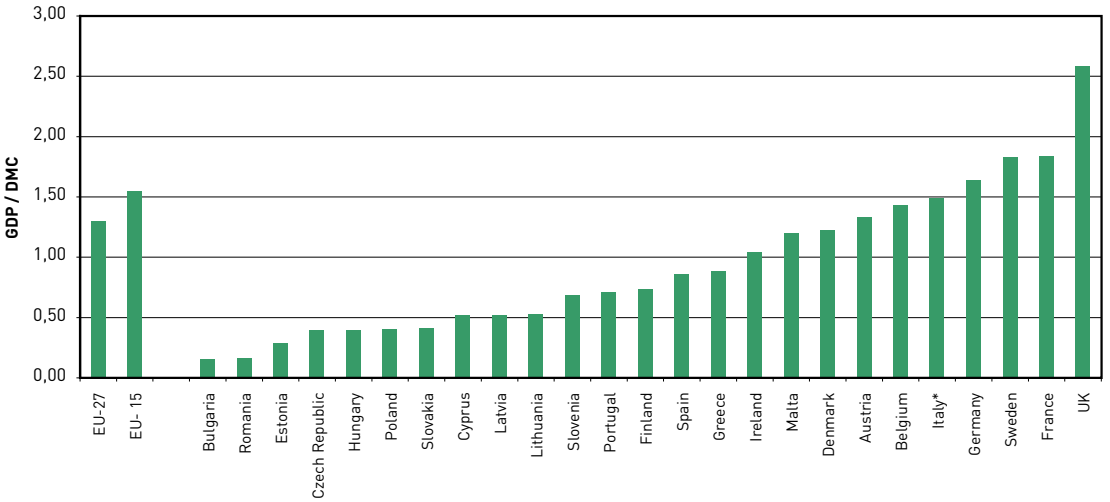


Figure 9 Resource productivity of EU-27 in 2005 without Luxembourg and the Netherlands (Eurostat)
*Data for Italy from 2004

4.2 Policies for a Green New Deal

New and additional policies are necessary to implement a Green New Deal that leads to system change and eco-innovation. Bleischwitz et al. (2009a) have outlined how a policy-mix of regulatory, economic and informational instruments could promote eco-innovation, but what about the current set of EU policies? Could they be a basis for effective short-term measures in the framework of the Green New Deal?

The European Commission claims that the 2009 budget allocated 10% of spending to the environment :[9] *"The proposal presented today also highlights the growing trend to gear policy spending towards the energy and environment, with a massive 10% of the budget going on environment"*.

An analysis of the EU budget shows that a Green New Deal in the EU will be determined by whether it can manage to green the largest spending blocs, which are Regional Policy and the Common Agricultural Policy (CAP). In 2009, CAP spending will remain around €60 bn and programmes supporting cohesion across Europe will receive a total of around €50 bn. Thus, regional and agricultural policy still account for almost 80% of the EU budget. Although the Commission presents rather traditional policies under new headings such as "sustainable growth" (Regional Policy) and "sustainable management of natural resources" (CAP), it remains to be seen whether the largest EU policies can be sufficiently steered towards a Green New Deal.

4.2.1 Common Agricultural Policy (CAP)


© iStockphoto.com/Wojtek Kryczka

Over the past 50 years, the intensification of agriculture – often supported by the Common Agricultural Policy (CAP) – has increased overall pressure on landscapes and biodiversity. Agriculture has contributed to soil degradation, water pollution and a loss of biodiversity (EEA 2006). Sustainable agro-environmental development and cross-compliance schemes show that farming and protection of the consumer and the environment can be harmonised. The CAP can be steered towards safeguarding a diversified agricultural sector, taking into account the specific territorial characteristics of Europe. This would not just aim at increasing agricultural productivity, but also seek to minimise external inputs (e.g. of fertilisers or chemicals). A green CAP could guarantee quality and food safety through a productive reorganisation and a high level of sustainable technological innovation. Thus, a greening of the CAP can be a potential driver of sustainable consumption and production by improving the quality of our food while protecting Europe's landscapes and biodiversity.

4.2.2 Regional Policy

From 2007 onwards, half of the regional policy budget is being dedicated to the development of the new Member States of Central and Eastern Europe. Huge financial injections will result in structural interventions shaping the long-term development of these countries. Schepelmann (2005) has shown that regional policy could boost sustainable development in the EU. Like no other EU policy, it can set a framework for research, technological development and the creation of markets by connecting public and private drivers of a Green New Deal. Regional governments can not only use Cohesion Funds to increase the overall eco-efficiency of their industry, but also to create regional clusters of eco-innovation (Schepelmann 2005). Nevertheless, most of the funds seem to be dedicated to traditional regional economic development schemes. For example, large conventional road transport schemes will contribute to a long-lasting increase in the pressure on the environment. Although most EU environment-related spending comes from the regional policy budget, it is still primarily dedicated to end-of-the pipe environmental protection.

9 http://ec.europa.eu/budget/budget_detail/next_year_en.htm

4.3 Programmes for a Green New Deal

The European Union already has a number of programmes dedicated to key parts of a Green New Deal: for example, the Seventh Framework Programme for research and technological development (FP7), the Environmental Technology Action Programme or the Competitiveness and Innovation Framework Programme (CIP). The central role of these programmes, combined with other instruments, has been outlined by Bleischwitz et al. (2009a) in a study requested by the European Parliament's Committee on Industry, Research and Energy (ITRE). The following descriptions of selected programmes are to a large extent based on this study. They show that the EU has already a number of policies which address central socio-economic and technological aspects of the Green New Deal.

4.3.1 The Competitiveness and Innovation Framework Programme (CIP)

The general aim of the CIP programme is to boost the competitiveness and productivity of European businesses, and to promote innovation activities by financing and delivering business support services. The main target group is small- and medium-sized enterprises (SMEs), and the programme period runs from 2007-2013. The total budget is €3.6 bn.

The CIP programme is divided into three operational programmes:

- Entrepreneurship and Innovation Programme (EIP) - €2.17 bn;
- Information Communication Technologies Policy Support Programme (ICT PSP) – €730 mn;
- Intelligent Energy Europe (IEE) - €730 mn.

The ICT PSP is not relevant for a Green New Deal, but the other two sub-programmes are.

The Entrepreneurship and Innovation Programme's main objectives are to support SME start-ups, cooperation and innovation. Strategies include "Eco-innovation" (in the "Eco-innovation/EIP"), which aims at supporting the first application and further market uptake of some of the best eco-innovative products. The four priority areas are materials recycling, building & construction, food & drink, greening business & 'smart' purchasing. EIP is financially the biggest part of the CIP by far, accounting for about 60% of the total CIP programme. Funds for the Eco-innovation/EIP strategy total €0.43 bn of the €2.17 bn (i.e. about half the IEE budget). Eco-innovation/EIP projects are funded with 40% to 60% of total eligible costs, to help bridge the gap between research & development and eco-industries. Calls for applications for funding are published every year within the programme period.

The Eco-innovation/EIP programme supports the first application and further market uptake of products and services in eco-industries with high potential in Europe, and aims to help overcome critical barriers that still hamper their commercial success. Thus it has the potential to be a major instrument to support eco-industries.

Intelligent Energy Europe II is the EU's tool for funding action to foster more efficient forms of energy production and consumption and the adoption of new renewable energy sources. The IEE programme does not fund technical RTD projects. Existing measures are 'SAVE' (energy efficiency and rational use of energy), 'ALTENER' (new and renewable energy sources), 'STEER' (energy in transport) and integrated initiatives. The IEE II Programme is implemented through grants (call for proposals or concerted action) and procurement (calls for tender).

IEE measures aim at supporting the use of renewable energy sources and the rational use of energy. They do not support the development of new technologies (see FP7), but rather aim at changing the legal and societal framework conditions for initiating a change (optimal implementation and preparation of legalisation). The work programme stresses that projects have to build on well-tested strategies and technologies, and aim at removing non-technological market barriers rather than developing new approaches. 'Market transformation' and 'change of behaviour' are frequently used keywords within IEE. Awareness-raising campaigns and capacity building both at the public level and at the level of key stakeholders (industry, trade), are a means of achieving behavioural changes, and public authorities should lead by example.

4.3.2 The Seventh Framework Programme for research and technological development (FP7)

The EU's Seventh Framework Programme for research and technological development (FP7) is the largest research programme in the world. It bundles all research-related EU initiatives together in order to develop the European Research Area (ERA) and to reach the goals of the EU's Lisbon Strategy: growth, competitiveness and employment. During the programme period 2007-2013, the FP consists of four basic components:

1. Cooperation (€32 bn)
2. Ideas (€7.5 bn),
3. People (€4.7 bn); and
4. Capacities (€4.1 bn).

In addition, there are specific programmes for the Joint Research Centre and for the Euratom nuclear research and training activities.

Collaborative research constitutes the core of EU research funding. Within the ten distinct themes of the largest FP7 "cooperation" component (a total of €32 bn), several have a strong reference to central aspects of a Green New Deal, for example:

- environment;
- social science and humanities;
- nanoproduction;
- energy;
- food agriculture, fisheries and biotechnology.

The "Environment" work programme aims at advancing our knowledge about the links between the biosphere, ecosystems and human activity, and also developing "new technologies, tools and services, in order to address in an integrated way global environmental issues".

The "Nanoproduction" work programme aims at moving from a resource-intensive to a knowledge-intensive economy. It supports research and technological development at the crossroads between different disciplines. Research is aimed at the product and process level, enforcing the generation of high added-value products and related processes and technologies.

The work programme of the "Energy" theme aims at transforming the current energy system, for example by reducing dependency on imported fuels, increasing diversification of energy sources, energy efficiency, etc. The work programme focuses on technologies identified in the strategic energy plan as key challenges for the next 10 years; i.e. second generation biofuels (in particular bio-refineries), carbon capture and storage, solar energy, offshore wind and smart electricity grids.

The work programme for "Food, Agriculture and Fisheries, and Biotechnology" is designed to contribute to a European Knowledge Based Bio-Economy (KBBE), including a 'sustainable use and production of renewable bio-resources'. This includes alternative eco-efficient processing routes for established industrial processes using biotechnology-enabled approaches. The programme requires a substantial contribution from industry and should foster innovative breakthroughs in biotechnology applications aimed at improving eco-efficiency.

Energy efficiency is also tackled within SME-related research, which aims to help SME associations to develop technical solutions to problems common to a large number of SMEs in specific industrial sectors or segments of the value chain.

Under the 7th Framework Programme, it is estimated that up to 30% of the €32 bn budget will focus on environmental technologies. This includes hydrogen and fuel cells, clean production processes, alternative energy sources, CO_2 sequestration, bio-fuels and bio-refineries, energy efficiency, information technologies for sustainable growth, clean and efficient transport, water technologies, soil and waste management, and environmentally friendly materials.

The work programmes for the FP7 topics discussed above mainly aim at the development of new green technologies (product level) or new production chains (process level). Understanding the economic and social driving forces behind unsustainable patterns of natural resources use at the system level seem to be underrated, with the exception of the social science and humanities work programme (SSH).

4.3.3 Environmental Technology Action Plan (ETAP)

Since 2004, the Environmental Technology Action Plan (ETAP) has aimed to stimulate the development and uptake of environmental technologies on a broad scale. It complements the Directorate-General's regulatory approaches and directly addresses the three dimensions of the Lisbon

and Sustainable Development Strategies: growth, jobs and the environment.

ETAP's achievements are reported every two years to the European Council and the European Parliament. So far, two reports have been made available: the first in 2004; the second in 2007.

ETAP consists of a sequence of 28 actions following the order announced in the Commission's Communication on ETAP published on 28 January 2004. They can be grouped in nine sections:

1. Research and Development (see also FP7)

2. Technology platforms and public private partnerships (PPP)

3. Verification of technologies: establishing networks of testing centres, drafting catalogues of existing environmental technologies

4. Definition of performance targets based on best environmental performance

5. Mobilisation of financing: e.g. by introducing enhanced funding and risk-sharing mechanisms, such as CIP (see section 1.2.1), LIFE, or via the European Investment Bank or the Cohesion Policy

6. Market-based Instruments: reviewing Cohesion Funds, state aid guidelines, environmentally harmful subsidies, and market-based instruments

7. Procurement of environmental technologies: e.g. using life-cycle costing or technology procurement; promotion via Commission's handbook on Green Procurement or Member States' action plans.

8. Business and consumer awareness-raising and targeted training, e.g. via the ETAP website and newsletters;

9. Acting Globally: promoting environmental technologies in developing countries and countries in economic transition via global financing opportunities and responsible investment and trade.

The dissemination of experiences is supported by national roadmaps and the stakeholder's Forum on Eco-Innovation. However, the central role of dissemination seems to be underrated within the ETAP framework and should be further developed. Nevertheless, given the wide range of policy areas involved in the implementation of ETAP (research and technology development; public procurement; corporate social responsibility; development aid, etc.), it could be one of the key policy frameworks to realise a Green New Deal in Europe and beyond.

5. Conclusions and recommendations

EU Energy Commissioner Andris Piebalgs (2009, 4) wrote in a working paper for the Robert Schuman Centre for Advanced Studies: *"If we invest wisely in research and give European companies the right incentives to become world-leaders in renewable and other low-carbon energy technologies, we can put the EU at the forefront of the third industrial revolution".* Indeed, a Green New Deal should lead towards a third industrial revolution not only in the field of energy, but in all sectors relevant for natural resource use: we need a resource efficiency revolution. The fact that a Commissioner writes about a revolution indicates that this resource efficiency revolution will not sweep away the European Union as we know it, but rather that a pragmatic Green New Deal can build on what is already there using powerful driving forces within the system.

Strategies

On a strategic level, there is still a lack of a guiding vision for a systemic adaptation of production and consumption patterns. Sustainability objectives still lack coherence across all EU activities, for example the vision proposed by Bringezu and Bleischwitz (2009). Nevertheless, the green parts of the Lisbon Strategy combined with the Sustainable Development Strategy contain elements which could be used as the central building blocks of such a vision.

The reporting mechanisms of the Structural Indicators and the Sustainable Development Indicators should be improved and further developed, but they could be used immediately as a key component of a Green New Deal. In particular, they could monitor EU-wide improvements in resource productivity.

Policies

Major EU policies could boost a Green New Deal by combining EU and national funding. With its Cohesion Policy, the EU has already a large funding system dedicated to structural change. According to the European Commission, a substantial amount will be spent on a sustainable regional policy: *"Between 2007 and 2013, the total amount of Structural and Cohesion Funds allocated to environmental programs has doubled since the previous period to around €100 bn – 30% of the total. Half of this investment will be devoted to direct infrastructure investments related to water and waste treatment, renewal of contaminated sites, pollution reduction, and support for nature protection and risk prevention. The other half will go to indirect investments with an environmental impact on areas such as transport and energy systems, eco-innovation, environmental management for businesses, urban and rural regeneration, and eco-tourism. For example, over €7 bn is earmarked to support energy efficiency and*

renewable energies" (CEC 2008). Thus, EU regional policy is already operating in the same order of magnitude as the green stimulus of the European recovery programmes.

In the wake of the current economic crisis, funding rules changes have been adopted which aim at simplifying eligibility for EU co-financing, as well as increasing and accelerating payments. For example, these changes would allow pre-financing of EU funding through the European Regional Development Fund (ERDF) and the European Social Fund in 2009 and 2010, plus an additional 2% in the CEEC, equivalent to €4.6 bn.

According to Friends of the Earth Europe,[10] most of the new EU Member States have already planned or adopted national recovery packages which focus largely on speeding up EU funding for infrastructure. According to Friends of the Earth Europe and the CEE Bankwatch network, backing up national recovery plans with additional Community funds has both risks and opportunities. On the one hand, there is an immediate risk that this boosts conventional, unsustainable infrastructure planning, as illustrated by FoEE and CEE Bankwatch (2009). This would have a long-term negative effect on, for example, transport and increase overall material and energy consumption in the affected regions. On the other hand, it is an opportunity for a Green New Deal. According to FoEE and CEE Bankwatch (2009), there is evidence of positive impacts: *"In the Czech Republic, for instance, the Ministry of Environment is set to reallocate €470 mn towards EE/RES [energy efficiency/ renewable resources] this year. In Latvia, EU funds support will increase from €20 mn to €73 mn for the improvement of heat insulation in multi-apartment residential buildings. Other countries make a step further by contemplating additional 'high-value' stimulus measures – in Poland, the government has proposed €333 mn for wind turbines and highly effective co-generation energy facilities. Slovakia will allocate more funds for EE/ RES from the Bohunice Nuclear Power Plant International Decommissioning Support Fund and will develop soft measures such as a new program in support of EE [energy efficiency]".*

It is obvious that for any Community funding, green conditionality is necessary. It is not justifiable to EU taxpayers to spend 30% on sustainable development and risk that 70% supports development which set the regions of Europe on a course in conflict with the objectives of the Sustainable Development Strategy. In particular, deregulated and intermediate support for national recovery plans needs to be connected to a Green New Deal. In the short term, additional support should only be granted if it can be linked to the green stimulus of national recovery programmes. Thus, the EU could create a fast-track "green light" mechanism: Community funding will be granted on a deregulated and fast-track basis if it is co-financed by a national green stimulus. To avoid questionable 'green' contributions, Member States and regions need to show that the national stimulus programme contributes to improving a country's resource efficiency, already monitored via the Sustainable Development Indicators or the green Structural Indicators. The link between EU Cohesion Funding and national green stimulus programmes and the SDI would address two persistent problems of EU Regional Policy: a lack of co-funding and accountability. Using the established Cohesion Funds and reporting mechanisms would also allow the Community to implement a Green New Deal immediately.

Programmes

Short-term Community support for a Green New Deal could be followed up by more consolidated medium-term action to integrate the necessary components of an appropriate policymix. This could be achieved mainly by improvements at the (inter) regional programming level. As demonstrated in this chapter, the EU already has a number of sophisticated RTD programmes which are contributing to a greening of the EU economy. The different EU policies affecting a Green New Deal would have to converge and should be strengthened with Cohesion Funds. A concrete proposal for improving this kind of policy integration has been formulated by the Scientific and Technical Research Committee of the European Union (CREST). The Commission has published a report based on the CREST guidelines on using synergies between Structural Funds, the Research Framework Programme, and the Competitiveness and Innovation Programme (CIP).[11] Further integration with the Environmental Technology Action Plan could be sought. Such an advanced scheme for using the EU budget could

10 http://www.bankwatch.org/billions/projects-crisis.html
11 COM (2007) 474 final.

be the foundation for developing a "triple-helix" consisting of stakeholders from enterprises, the public sector, research and teaching, who could drive and implement a lasting EU Green New Deal. As further explained in chapter 6, priority areas for advancing regional change could be sustainable mobility, and energy and material efficiency.

As demonstrated in chapter 3, the success of eco-industries depends on continuity and political leadership. Instead of a revolution, a Green New Deal requires continuous effort by all stakeholders to build a sustainable Europe. Much more than additional money, a Green New Deal needs political capital, which is much more difficult to muster: a political determination to halt unsustainable spending practices and to implement and integrate in economic development strategies measures to improve resource productivity as outlined, for example, in the EU Sustainable Development Strategy, the Environmental Action Programme and other relevant strategies. To improve resource productivity, the EU can build on its experience with a number of research and technological development programmes such as the Environmental Technology Action Plan and various successful regional development schemes.

As shown above, there are no principal arguments against a European efficiency revolution. The EU has already established Europe-wide consensus on elements within existing strategies, policies and programmes which could be used to start an efficiency revolution – immediately.

6. Analysing the main sectors and levers for a "Green Deal" in the EU-27

6.1 Transport policy - problems and challenges in the European Union

Transport in the European Union contributes to several major environmental problems, as is shown by the European Environment Agency (EEA) in the Transport and Environment Reporting Mechanism (TERM) report for 2008. The transport sector accounts for 19.1% of the European greenhouse gas emissions (EU 27, 2005; Eurostat 2009).

Road transport is an especially critical sector, as it accounts for more than 70% of CO_2 emissions from transport (EU15, 2004; EEA 2007). Almost 85% of the passenger kilometres in the EU-15 are travelled by car, and more than 76% of freight (tonne-km) is transported by road (Eurostat 2007). Road transport is still growing throughout the EU-27, and its greenhouse gas emissions are rising as well.

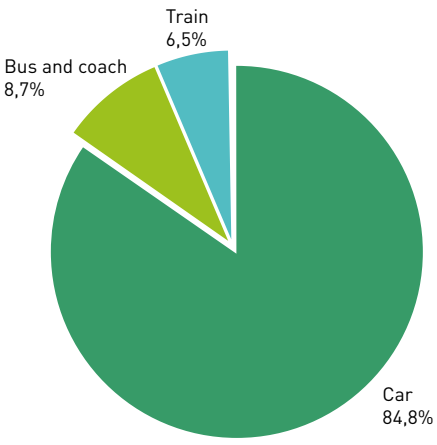


Figure 10 EU-15 modal split of inland earthbound passenger transport, 2004, % in passenger-km (Eurostat 2007, p. 79)

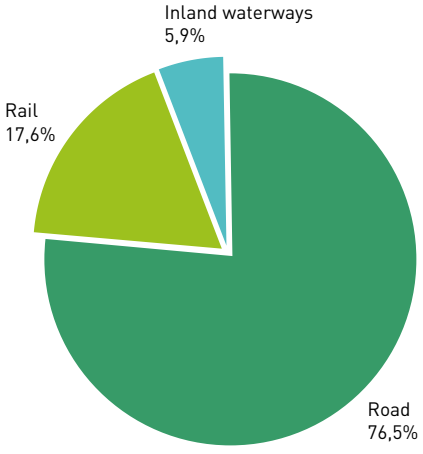


Figure 11 EU-27 modal split of inland earthbound freight transport, 2005, in tonne-km (Eurostat 2007, p. 78)

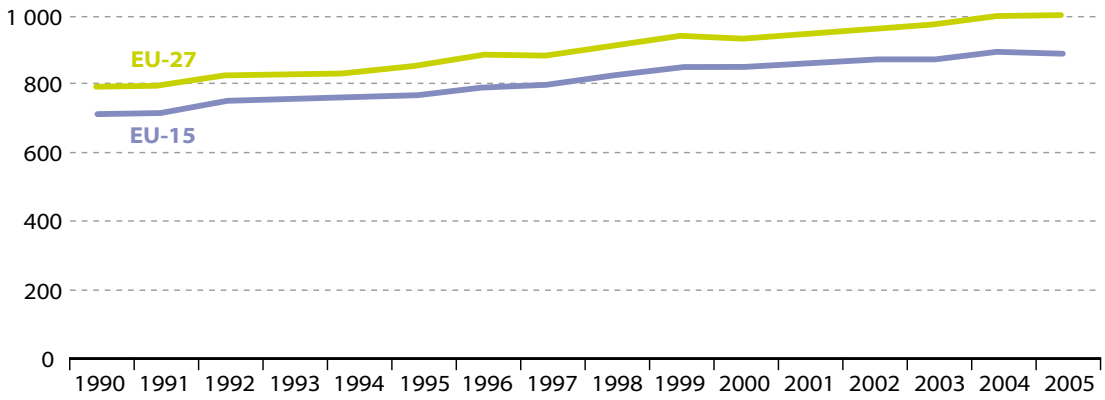


Figure 12 Greenhouse gas emissions from transport, million tonnes of CO_2 equivalent (Eurostat 2007, p. 83)

In addition to CO_2 emissions, road transport also causes other environmental and health problems such as air pollution, noise, land use and landscape fragmentation, impacts on habitats and biodiversity, and serious accidents.

Noise from road and rail transport is a severe problem, especially in densely populated areas. More than 210 million EU citizens are exposed to levels of road noise that put their health at risk or cause annoyance, stress and sleep disturbance (CE Delft 2007).

Air pollution by particulate matter, nitrogen oxides, sulphur dioxide and ozone caused by road transport seriously damages human health and the environment (CEC 2005b).

These problems are set to increase significantly unless there is a strategic shift in transport policies worldwide, as transport in newly industrialised countries like China or India is growing fast. It will not be possible to meet climate targets and the objectives of cutting pollution, noise and accidents without a fundamental transformation of the transport sector.

Improving the sustainability of transport is not only a key challenge in fighting climate change and other environmental problems, but, as an important sector in modern economies, more efficient and sustainable transport systems contribute to economic growth. Thus, integration of sustainable transport investments in European recovery plans can provide important stimuli for economic development and employment.

Urban mobility is crucial to achieve sustainable transport. Over 60% of the EU population lives in urban areas of over 10,000 inhabitants. Urban traffic is responsible for 40% of the CO_2 emissions from road transport and 70% of emissions from other road transport pollutants (CEC 2007a).

Besides environmental problems, social aspects also need to be addressed: sustainable transport faces individual mobility problems caused by disability, age or other reasons. The special requirements of low-income households also have to be considered.

Regarding political strategies and social and economic conditions, freight and passenger transport are quite different, as are "earthbound" transport modes and air and sea travel. Thus, this section exclusively concentrates on describing problems and solutions in the field of earthbound passenger transport.

6.1.1 Strategies for sustainable passenger transport

There are no simple solutions to achieve sustainable transport that meets environmental, social and economic requirements. Until now, the impact of fuel-efficiency improvements have been offset by several rebound effects: an increase in the number and weight of cars, the upsizing of engines and the kilometres travelled. Hence, an integrated approach in the field of transport policy is more promising.

A sustainable policy for passenger transport should focus on three basic strategies: reducing transport needs, a shift to more sustainable transport modes, and the promotion of efficient

vehicles and traffic flow (WI 2008). With respect to the sustainability of measures, a hierarchy of these three strategies can be introduced.

Reducing the need for transport altogether is a top priority, which involves maintaining mobility while reducing the kilometres travelled. This notion of mobility is defined by the capacity to carry out different human activities such as business, work, purchase, leisure and other social and cultural activities (Petersen 2004). It requires an integrated policy of transport and spatial development. Dense structures of housing, working and shopping facilities and places for leisure allow people to carry out their activities without travelling long distances.

However, measures in spatial and infrastructural development require long-term development – it can take decades before significant results are felt. Thus they are not the focus of this study, which is primarily looking at the short-term effects of recovery packages.

A second strategic aspect of sustainable mobility relates to the way in which remaining transport needs are satisfied. The different modes of earth-bound transport – walking, cycling, buses, trains and cars – have different environmental advantages and disadvantages.

The non-motorised modes have the least impact on the environment, followed by bus and train; cars have the greatest impact. Therefore it is reasonable to support zero-emission mobility over short distances, and train and public transport by bus or tram for medium-range or longer distances. This includes the provision of infrastructure and its interconnection to promote intermodality, the purchase of vehicles, mobility management, and information, education and service measures. While infrastructure investments usually take a long time, the other measures can be integrated in a Green New Deal programme. They act as pull-factors for a modal shift. Push factors should also be introduced: speed limits, low-emission-zones or congestion charges, eco-taxes on fuel and higher motor vehicle taxes for gas guzzlers are examples of measures that help level the uneven conditions for more sustainable modes of transport.

The third strategic pillar is the improvement of transport efficiency. This includes measures related to vehicle technology as well as intelligent traffic management systems and eco-driving. Policy instruments in this field are emission


© Shutterstock

limits, fiscal measures to integrate external costs of transport, and R&D programmes; the latter two are possible parts of a Green New Deal.

In summary, the following possible elements of a Green New Deal can be identified:

- investments in new transport vehicles – buses, trams and regional trains;
- investments in short-term infrastructure for bicycle and pedestrians;
- investments in infrastructure improvements for public transport;
- investments in services to improve the user-friendliness of public transport;
- incentives for retro-fitting cars and public transport vehicles;
- fiscal measures to subsidise low-carbon vehicles;
- research into energy efficiency technology;
- marketing of more sustainable modes of transport;
- education on eco-driving.

In addition to the environmental targets of sustainable transport, the social dimension (the mobility needs of people without cars) and economic dimensions (e.g. cost/benefit analysis of modal split change and higher transportation costs caused by internalising external effects) of sustainable mobility should be recognised.

6.1.2 Existing recovery programmes in the European Union – instruments in the passenger transport sector

The existing recovery programmes of EU and member states already contain several measures concerning passenger transport.

The European Economic Recovery Plan, proposed by the Commission, contains a "European green cars initiative" to promote the use of renewable and non-polluting energy sources. The proposed contributions of the Member States and the EIB to research account for €5 bn. (HSBC 2009)

Important recovery programmes of the Member States contain various expenditures related to transport, for example: (HSBC 2009)

- several Member States are investing in road and railway infrastructure (Germany, France);
- Germany is investing €2 bn in public transport systems in 2009 and 2010, France is investing €950 mn in new high-speed railway lines. For rail transport, the stimulus programmes of Germany, France, Italy and the UK together contain €5.8 bn of expenditure. This is a relatively small amount compared to the spending on the car industry.
- France, Germany, Great Britain, Italy, Spain and Sweden have launched programmes supporting their car manufacturers, mostly with credits (e.g. France with €6 bn for Renault and Peugeot-Citroen). Credits for the car industry are also provided by the European Investment Bank – amounting to €9 bn in 2009.
- Germany has launched a programme for the development of electric mobility worth €500 mn, for example for battery development, grid adaptation and integrated concepts in model regions in the years 2009 to 2011 (BMWi et al. 2009).
- Following the lead set by France and Germany, Austria, Cyprus, the Netherlands, Italy, Luxembourg, Portugal, Romania, Slovakia, Spain and the UK launched incentive schemes for scrapping old and purchasing new cars (ACEA 2009). The effects of different programme designs are described in the box.

Scrapping Bonus as an example for different instrument designs

In April 2009, the European Automobile Manufacturers Association ACEA reported a decline in new passenger car registrations for the 11th consecutive month, with a fall of 9% in March compared to the same month last year – following the sharpest falls in January, down 27% (ACEA 2009b).

The German and the French markets helped to weaken the downward trend. In both countries, governments introduced large-scale incentive schemes for buying new cars, followed by 10 other EU member states. Together, those schemes led to a recovery in European car markets (ACEA 2009c).

Figure 13 New Passenger Car Registrations in Europe 2008-2009 (ACEA 2009b)

In France, the scheme started in December 2008. It subsidized the purchase of a new car if a vehicle which is at least 10 years old is scrapped. The subsidy, which was later raised from €300 to €1000 now, is only paid for new cars that emit less than 160 g CO_2/km. In total, €500 mn will be allocated to "scrappage" and the *"bonus malus"* scheme in 2009 (HSBC 2009).

The less-than-160g emissions requirement sets the French scheme apart from the German "environmental bonus" (*Umweltprämie*) introduced in January 2009. In Germany, €2500 is paid for a newly licensed car and the scrapping of a car which is at least nine years old. The scheme accounts for €3 bn. The only environmental requirement is that the new car complies with the Euro 4 emission standard, which has applied to new car models since 2005.

Whereas the French scheme promotes the purchase of cars emitting less than the current average of the European car fleet, the German model does not affect the CO_2 emissions of the new cars. The scheme therefore allows for an old but energy-efficient car to be scrapped while potentially subsidising a new SUV. So far the government has received 1.3 million requests for the bonus. In the first four months of 2009, car sales increased by about 20% in Germany (VDA 2009) and the downward trend in France may have stabilised (ACEA 2009b).

An analysis of the German scrappage bonus shows a trend towards smaller and less-emitting cars: average CO_2 emissions from newly registered cars in April 2009 were155 g/km - 10 g/km below the same month in 2008 (IG Metall 2009). The trend towards lower emissions can be explained by the group addressed by the bonus: low-income earners generally own cars that are at least 9 years old, and they do not usually buy new vehicles; encouraged by the bonus, they tend to buy smaller and thus lower-emitting new cars.

Nevertheless, it is doubtful if this relatively small decrease in the CO_2 emissions of new cars contributes to lower CO_1 pt emissions overall. A considerable share of the emissions emerges during the production of a car. Different production techniques and measurement problems make it difficult to calculate specific data, but the numbers resulting from exemplary studies range between 7 and 15% of the CO_2 emissions (Kim et. al. 2004; Automotiveworld 2009). The earlier a car is taken off the streets, the higher the percentage of lifecycle energy necessary for its production. Thus the positive effect of a slightly less-emitting fleet is offset by the energy used in the production process due to advanced scrappage.

Beyond this, there are other critical aspects to the sustainability of scrappage schemes. The relatively high and short-term subsidies are incentives to buy a car and not think about choosing other modes of transport like public transport or using car-sharing.[12] The long-term economic effectiveness of the schemes can also be questioned, because many of the cars would have been bought later anyway (HWWI 2009).

It would be environmentally more effective to introduce more targetoriented instruments, like a bonus for especially fuel-saving cars. Oriented towards the CO_2 emissions of new cars, a bonus would be awarded for cars below 140g CO_2/km, the value of which would increase with decreasing emissions. This kind of bonus system has the effect of reducing fleet emissions significantly while simultaeneously promoting efficient technology.

6.1.3 Profiles of key instruments in the earth-bound passenger transport sector

The EU transport sector is of considerable economic importance: about 5.7% (2005) of the population in the EU-27 work in the transport services sector, of whom about 900,000 (2006) are employed in the railway sector (CEC 2009d). A further 1.5% work in vehicle manufacturing. The International Association of Public Transport estimates that about 1 million people in the EU are directly employed in the public transport sector, and for every direct job, 2 to 2.5 indirect jobs typically exist. Turnover is about €125 bn per year (UITP 2009a). Without an in-depth analysis of employment structures, it is difficult to clearly distinguish between the public transport and car traffic sectors: the automotive industry constructs both cars and buses, and supply firms work for both sectors.

Altogether, the transport sector accounts for some 8.9% of the EU's GDP. 13.5% of private household spending is on transport. About one-third

12 The term car-sharing is used in the sense of an organised short-term car-rental, in contrast to private car sharing.

of this sum (around €310 bn) is used for the purchase of vehicles, almost half (€470 bn) for operating personal transport equipment (e.g. fuel for cars) and the remainder (€169 bn) is spent on transport services like bus, train or plane tickets (EU27, 2005; CEC 2009b).

The following chapters focus on four fields of action: support for public buses, support for regional trains and urban trams, the promotion of walking and cycling, and support for fuel-efficient cars. The different measures in these fields fall in three categories of instruments: a) direct investments; b) support for technology to increase competitiveness; and c) soft measures, such as education and marketing, that help reduce emissions but have no investment effects.

These measures implement modal shift strategies with both push and pull factors, as well as strategies for a higher energy efficiency of the existing modes.

Support for public buses – fleet renewal and extension, bus technology research, eco-driving, marketing

Public transport by bus has great advantages over private car transport with respect to energy use and greenhouse gas emissions – per passenger-kilometre, urban bus transport causes only about half of the CO_2 emissions of a car (UBA 2007). Public buses contribute to an attractive and inexpensive urban transport system. Extending and greening the fleet and marketing and education measures are also suggested by the European Commission's Green Paper on Urban Transport. The following measures to strengthen public buses should be supported:

- fleet extension: rising passenger numbers show the growing acceptance of public bus transport throughout Europe. More capacity allows increased frequency of service and strengthens the bus network. This raises the quality and capacity of the public transport and creates incentives for a modal shift from car to bus;

- fleet renewal: quick procurement of energy-efficient and low-emitting buses can help to achieve two goals – not only avoiding greenhouse gases, but also other pollutants such as diesel soot and NOx-emissions – in line with the Directive on air quality (1999/30/EC). Today, fewer than 5% of the buses in the EU-27 comply with Euro 4 or higher (UITP 2009b). There is particularly significant potential for fleet renewal in the new member states with large shares of Euro 1, 2 or Pre-Euro vehicles. Buses with particle filters that meet the EEV-requirements are already available; hybrid buses, which are especially efficient in urban traffic, will probably be launched onto the market in 2010. The CO_2 emissions of hybrid buses are up to 30% lower than those of conventional buses (Mercedes-Benz 2008);

- research: a research focus on bus efficiency technology can develop technological potential like lightweight design, hydrogen technology and electric engines;

- education in eco-driving: driving in an energy-efficient way can save 5 to 10% of fuel in urban traffic. Eco-driving courses for bus drivers should be supported;

- public transport marketing: together with improvements in the public transport system, soft policies like social marketing can create pull factors towards public transport. The focus should be on cities and agglomerations.

These measures can have an impact on employment in several sectors: the automotive and supply industry, transport planning and consulting, driving training, marketing and advertising.

The size of the job-creation potential is difficult to estimate as it depends on various assumptions. Rough estimates made in a recent short-term study by HSBC give a first impression of the potential: South Korea's government estimates it will create about 138,000 jobs with about €9 bn of spending in the public transport and railroad sector – which caters for a population of 49 million people (HSBC 2009).

Support of regional rail and urban trams – fleet renewal and extension

The role of regional sustainable rail transport compares with the role of urban buses described in the chapter above. Regional and suburban rail trips account for 90% of the total number of rail passengers and half of the passenger kilometres. Urban tram systems are being reintroduced and expanded at the moment – as in Strasbourg, where the tram, introduced in 1994, could double the modal split of public transport within 10 years (UITP 2009c).

CO_2 emissions from regional rail transport per passenger-kilometre are approximately 30% below the emissions from cars, and emissions from tram or metro systems are as much as 50% lower (UBA 2007). Rail and tram transport contributes to an attractive urban and regional transport system. The following measures should be supported to strengthen regional rail and urban tram transport:

- fleet extension: although the modal split of railway transport remains low, at 6.1% of the passenger-kilometres travelled in the EU, absolute numbers are rising. At the same time, the stock of rail vehicles and coaches is decreasing (Commission 2009d). The extension of urban tram systems often fails to occur because of tight municipal budgets;

- fleet renewal: infrastructure for regional rail transport in many EU member counties is close to capacity limits. Besides an extension of the rail network, modernisation of the rail vehicle and coach fleet can expand capacities, by for example buying double-deck coaches and energy-efficient locomotives. Renewing the tram fleet, introducing energy-efficient low-floor trams, can increase the attractiveness of public transport and help establish barrier-free urban transport.

Employment effects can be expected in the railway and supply industry as well as in railway and urban transport service staff.

Noise Reduction: Measures for vehicles and infrastructure

Reducing traffic noise does not only have positive effects on well-being and health, but also has a substantial economic impact: the Commission estimates the total cost of noise at 0.2 to 2% of the Union's GDP (CEC 1996). Measures tackling the source of the noise – the vehicles and the transport infrastructure – are more effective than reducing noise emissions by, for example, installing noise barriers and insulated windows (KPMG 2005). As a part of a Green New Deal, the following measures should be supported:

- incentives for the purchase of low-noise tyres for cars and buses: the traffic noise reduction potential of tyres produced with the technology available today is 2-4 dB, which means halving the volume. Grants for buying them can accelerate market penetration. This measure should be supported by strengthening EU tyre standards to address noise reduction and fuel consumption as well as emissions and noise labelling;

- fleet renewal and the extension of regional rail and urban trams (see 0) should include requirements for state-of-the-art noise reduction technologies such as low-noise engines and brakes;

- railway infrastructure should be improved for the purpose of noise reduction by periodical monitoring and the grinding of rails; road should be renewed with open-pore asphalt.

Emission Reduction: Retro-fitting cars and buses

According to EU regulations (2008/50/EC) and the Thematic Strategy on Air Pollution (CEC 2005b), pollutants like ozone, sulphur dioxide, nitrogen oxides and particulate matter have to decrease significantly. On the municipal level, clean air plans, including for example environmental zones, are an instrument to meet the emissions objectives. They should be supported by incentives for retro-fitting private and public road vehicles with particulate filters, as illustrated by the following good practice examples:

- cars: a retro-fitting bonus of €330 for car owners was successfully implemented in Germany in 2007 (BMU 2009a). More than 350,000 cars have been equipped so far;

- buses: a programme for retro-fitting public buses with particulate filters is in force in California – the Lower-Emission School Bus Retrofit Programme (ARB 2009) – using American Recovery and Reinvestment Act funding. In France, a €1300 subsidy is given for retro-fitting particulate filters on buses (ADEME 2009);

- commercial vehicles: the Netherlands, the Lombardy region in Italy, Flanders in Belgium and Scotland in the UK pay bonuses for retro-fitting commercial vehicles. (dieselretrofit.eu 2009).

Promotion of walking and cycling – infrastructure and campaigning

"Zero-emission mobility" (walking and cycling) is sustainable in multiple ways: it emits neither greenhouse gases nor other pollutants or noise, and it is good for individual well-being and public health. To promote these modes of transports, better local infrastructure and information and image campaigning can help. The Green Paper on Urban Transport highlights the importance of education, training and awareness-raising to create a new urban mobility cultures (CEC 2007a). The proposed measures are:

- infrastructure extension: in contrast to road and rail infrastructure, the setting-up or upgrading of a dense urban cycle route network can be implemented quite quickly;
- image and information campaigns: campaigns to promote a modal shift from short-distance car transport to walking and cycling can be carried out by the EU or the member states. The implementation of such campaigns should integrate urban politics, civil society and local business.

These measures have positive employment effects in several sectors: transport planning and consulting, road construction, the advertising business, and the bicycle (equipment) industry.

Supporting people with mobility problems

Helping to find solutions for all kind of mobility problems is a concern of EU policy, although regulations have so far only been introduced on the rights of flight passengers with reduced mobility (Regulation (EC) No 1107/2006). Particularly in light of demographic change, it is important to improve the accessibility of – and the quality of service on – public transport.

However, there are also social reasons for limited mobility. In 2007, 78 million people in the EU (16% of the population) were at risk of poverty (CEC 2007b). People living in low-income households often have problems paying the costs of mobility. As a result of higher unemployment due to the economic crisis, poverty rates are expected to rise.

The following measures should be supported to help people solve their mobility problems:

- improvements in infrastructure, vehicles and services: bus, tram and railway stations should be modified to better fit the needs of people with limited mobility, with ramps and lifts, blind stones or talking sign systems;
- supporting low-income households: public transport tickets at reduced prices should be provided, particularly for people in low-income households. This kind of voucher stimulates demand, as low-income households tend to spend rather than save their money.

Support for fuel-efficient cars according to EU CO_2-emission standards

The current crisis in the US car manufacturing industry underlines what climate change and spikes in oil prices have already shown: vehicles with high fuel consumption have no future; the automotive industry has to shift its strategic direction towards smaller, more energy-efficient cars, especially in new markets in the newly industrialised countries. Downsizing is required to make the cars smaller, lighter, slower and less powerful.

Under EU legislation on vehicle emission limits, car manufacturers will have to switch production to smaller and more energy-efficient cars. Incentives for consumers can also help to accomplish this "model switch".

A reform of the motor vehicle tax in relation to CO_2 emissions is an important incentive. The tax should take CO_2 emissions as a basis and rise progressively to encourage the purchase of energy-efficient cars. It should be aligned to the EU emission standards, taking the current and the future emission limits as cornerstones for a tax bonus. The progressive nature of the tax would ensure a big tax difference between an average-emitting car and one that complies with the fleet emission standards. Dynamic design can prevent a loss of effectiveness – and the tax curve can be shifted annually according to changes in emission limits.

The Green New Deal should include a bonus system for truly low-emitting cars, exempting those below 95 g CO_2/km from the tax completely and reducing it for those in the emissions range of 95 - 130 g.

A new motor vehicle tax can act as a truly environmentally friendly scrappage bonus, as it only sets incentives for the purchase of low-emission vehicles.

It can stabilise employment in the automotive Industry in a more sustainable way than undifferentiated scrappage schemes, as it will make European car manufacturers fit for the future.

6.2 Energy Policy: Problems and Challenges in the European Union[13]

The energy sector plays a crucial role in EU climate policy since it accounts for about 60% of all GHG emissions in the EU-15 (Eurostat 2008). Besides the environmental impact of energy production and consumption, the energy system is highly relevant for employment and economic development, and for vulnerability to external price shocks or problems of security of supply. Consequently, the EU's energy and climate package already has a special focus on further improvements in the energy system and on fostering energy efficiency in all end-use sectors. This also holds true for decreasing dependency on fossil fuels imports. With rising global energy prices, the increasing costs of energy imports put pressure on the competiveness of the EU.

Energy-related indicators at the EU level show, however, that there is a need to develop and implement additional measures and supporting schemes to reduce energy consumption and GHG emissions. Since 1995, for example, final energy consumption in the EU has increased slightly in both the EU-27 and in the Euro area (figure 14).

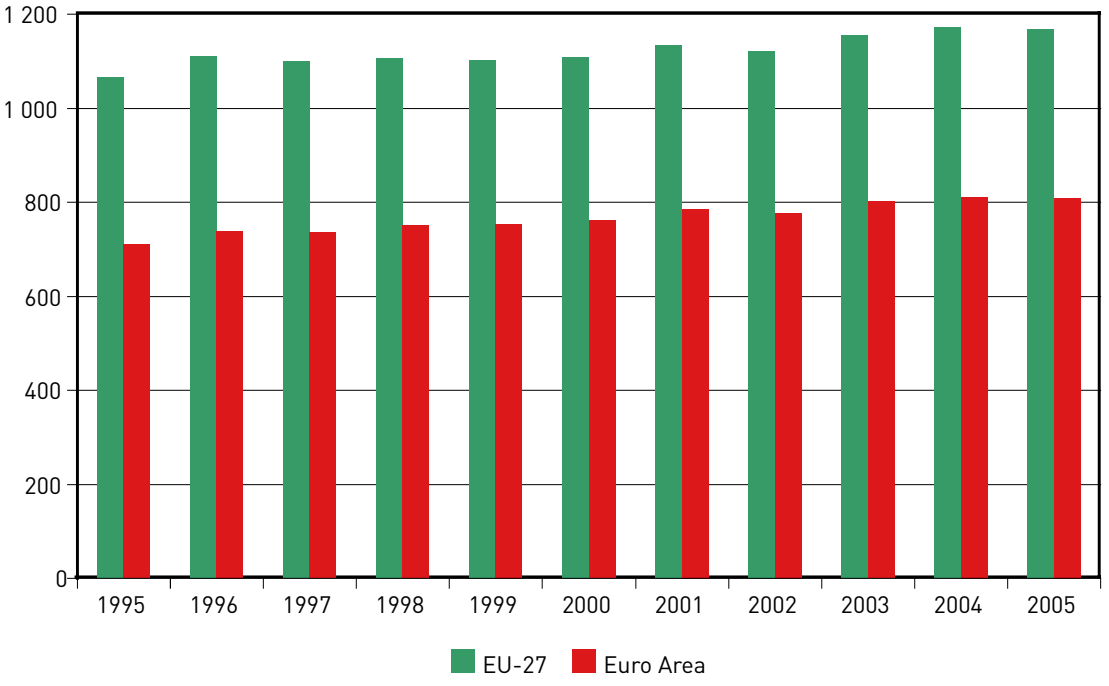


Figure 14 Final Energy Consumption in the EU (EU-27 and Euro Area; Eurostat 2008)

Despite this, most Member States in the EU-27 have been able to reduce GHG emissions compared to 1990 – though not dramatically (IEA 2020). The trend is only upwards in Slovenia, Portugal, Austria, Malta, Luxemburg, Lithuania, Cyprus, Italy, Spain, Greece and Ireland (figure 15). From a sectoral perspective, energy (59%) and transport (21%) are the largest emitting sectors. Other sectors (agriculture, industrial processes, waste) are responsible for the remainder of EU-27 GHG emissions (figure 16).

It is obvious that further efforts and initiatives, especially in the energy sector, are required to reach the ambitious emissions reduction targets set by the EU for the year 2020.

13 With contributions by Christof Arens and Vera Hoefele.

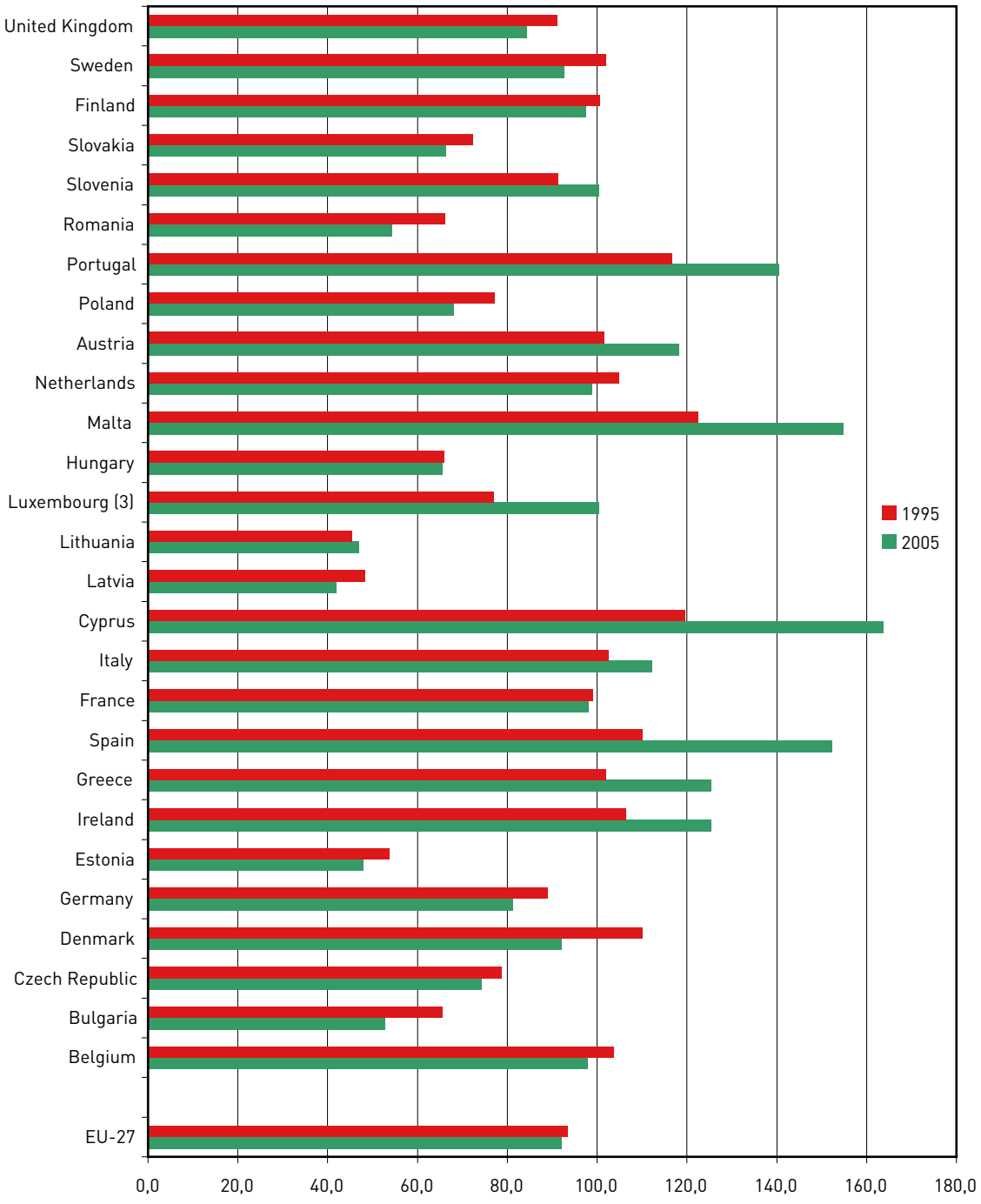


Figure 15 Greenhouse gas emissions by Member State (1995 and 2005 compared to 1990, based on data in million tonnes CO2 equivalent; Eurostat 2008)

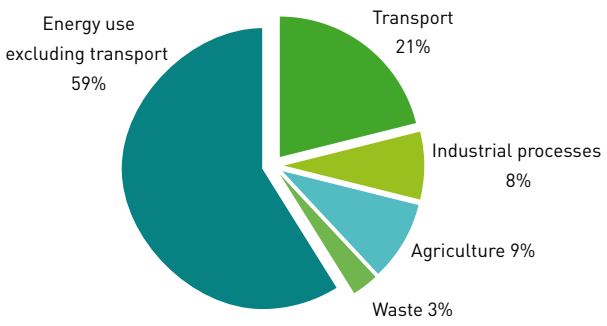


Figure 16 Greenhouse gas emissions by sector (EU-15, 2005 in percent, based on data in million tonnes CO_2 equivalent; Eurostat 2008)

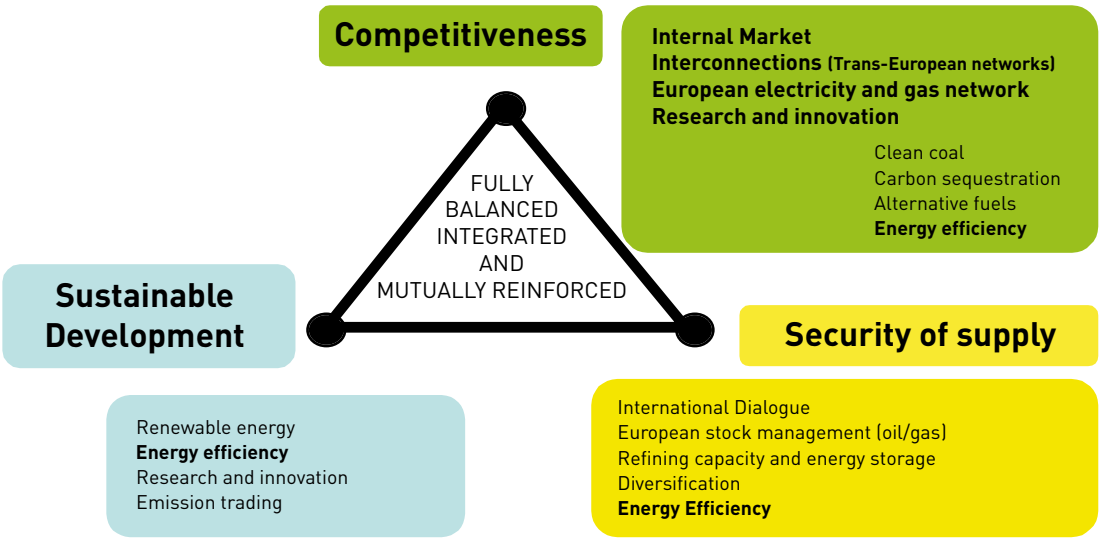


Figure 17 Integrated climate and energy policy of the EU (modified from Koskimäki 2008)

6.2.1 Existing regulations and strategies

On 23 January 2008, the EU presented its general design for an improved climate policy package to put the Union on track to further reduce energy consumption and greenhouse gas emissions in the years to 2020. Most of the elements have now been adopted by the European Parliament and Council. The European Commission itself has presented the 20/20/20 climate package as a strategic triangle balanced between sustainable development targets, improving Europe's economic competitiveness in the global context, and addressing security of energy supply issues (Koskimäki 2008), as shown in figure 17.

The EU's climate package consists of a broad spectrum of directives and regulations, including:

- the Effort Sharing Decision (2009/406 EC);
- the Directive on energy performance of buildings (2002/91/EC);
- the Ecodesign Directive (2005/32/EC);
- the Directive on energy end-use efficiency and energy services (2006/32/EC);
- the Directive on the promotion of co-generation (2004/8/EC);
- the Renewables Directive (2001/77 EC);
- the Emissions Trading Directive (2008/101/EC, 2004/101/EC, 2003/87/EC);
- the Car Directive.

Simultaneously, energy-related European projects and programmes have been funded within the Intelligent Energy-Europe programme (IEE) and in the context of regional development programmes (EFRE, URBAN, Cohesion Funds).

In financial terms, according to Edenhofer and Stern (2009), the EU has provided US$0.6 bn (€0.42 bn) to foster the use of renewable energies and US$2.8 bn (€1.97 bn) to support green investments in the building sector between 2009 and 2010.

These regulations and programmes have all been created to complement related activities and measures at Member State and regional levels. As an example, France provides US$0.9 bn (€0.63 bn) in fiscal measures to foster renewable energies between 2009 and 2010 and US$0.8 bn (€0.56 bn) to support refurbishments in buildings. These amounts of fiscal resources in the building sector are exceeded by the building programmes in Germany, for which US$10.4 bn (€7.32 bn) is being provided (ibid.).

6.2.2 Potential and abatement costs

In 2008, the Wuppertal Institute published an update of an integrated scenario analysis on behalf of the WWF: "How to achieve a domestic 30% GHG emission reduction target in the EU by 2020" (Lechtenböhmer 2008, based on Lechtenböhmer et. al. 2008). Its objective was to assess the effects of EU initiatives and Directives on the EU's climate package by the year 2020. The study demonstrated the potential to reduce GHG emissions until 2020 by about 30% compared with 1990 levels. However, due to a lack of active policies, especially in Member States, in recent years, the figure has declined compared to a similar study conducted in 2005.

As its 2005 predecessor did, the update stressed the major role of energy efficiency as a main contributor to greenhouse gas mitigation and energy savings in all sectors and Member States. In the so-called "Policies and Measures Scenario" (P&M), the final energy demand scenario decreases by 6.5% from 2005 to 2020 and almost 20% compared with the "Business-as-usual Scenario" (BAU). Accounting for nearly half of the overall savings, its impact is particularly strong on the residential sector. Final energy demand in this sector is reduced by about 11.6%. In terms of fuel demand, there is a sharp drop in solid fuels, decreasing by about 59%, and oil, decreasing by about 20%. In contrast, the demand for district heat (48%) and the direct use of renewable energies (134%) grows significantly.

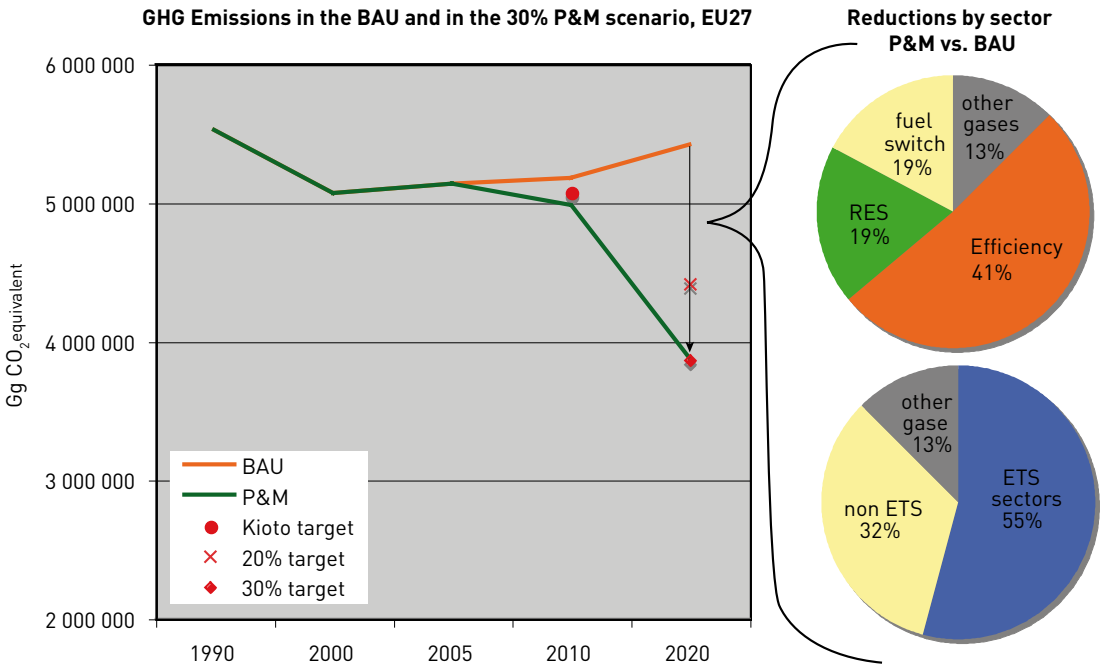


Figure 18 Overview of GHG emission reductions in the 30%-P&M scenario vs. BAU (WI 2008)

	Savings vs. BAU (2020)		Share of savings	Savings vs. 2005		Share of savings
	ktoe	%		ktoe	%	
Final Energy Demand by sector	**260,387**	**19.3%**	**100.0%**	**75,069**	**6.5%**	**100.0%**
Industry	69,838	19.0%	26.8%	21,936	6.9%	29.2%
Residential	64,482	19.2%	24.8%	35,709	11.6%	47.6%
Tertiary	40,619	19.8%	15.6%	8,913	5.1%	11.9%
Transport	85,448	19.5%	32.8%	8,511	2.4%	11.3%
by fuel (negative savings increase demand)						
Solids	30,974	60.9%	11.9%	28,604	5.9%	38.1%
Oil	150,304	27.9%	57.7%	95,398	19.7%	127.1%
Gas	84,394	29.1%	32.4%	65,181	24.1%	86.8%
Electricity	47,496	15.7%	18.2%	-13,098	-5.4%	-17.4%
Heat (from CHP and District Heating)	-6,952	-8.2%	-2.7%	-29,535	-47.6%	-39.3%
Other (mainly renewables)	-45,829	-58.0%	-17.6%	-71,490	-134.0%	-95.2%

Table 9 Final energy savings 30%-P&M scenario vs. BAU (WI 2008)

6.2.3 Strategic fields of action and employment effects

As a premise, the implementation of a green investment programme at the EU level will increase its long-term impact on emission reductions and employment if it is part of a coherent policy package at the EU, Member State and regional level. Policy research, for example, has shown that a coherent strategy for the building sector should include co-ordinated policy instruments at the European level targeted at both end-users and multipliers. In complete policy packages for end-users, the provision of financial incentives such as soft loan schemes or direct financial subsidies represent only one element, complemented by related information measures (public information campaigns), advice and consultancy, institutional measures (e.g. energy agencies) and regulatory approaches. In addition to measures targeted at improving energy efficiency among end-users, a coherent strategy will also address relevant multipliers, market agents and producers through educational initiatives, measures to ensure quality control, market-based instruments and services, networking activities and voluntary agreements with (sub-) sectors (Schüle et al. 2009).

There is as yet no comprehensive data available on the impact of green investment programmes on employment. In 2005, the renewable energy sector employed about 1.4 million people with a gross value added of €58 bn in the EU, although the significance of the sector varies strongly between Member States. Biomass, wind and hydro technologies are currently the most important for employment. In the future, significantly more people are expected to be employed in the renewable energy sector, especially in the Member States that joined the EU in 2004 and 2007. A European study (ISI-Fraunhofer et al. 2009) concluded that the development of renewable energy will create about 900,000 new jobs by 2020, of which some 400,000 will be created in the renewable energy sector and about 500,000 in agriculture and forestry areas that supply primary fuels.

Improved energy efficiency in general will be able to contribute at least the same amount. FIEC (quoting from Ernst & Young 2006) estimates that about 26 million workers in the EU depend on the building construction sector, directly or indirectly. Between 14 million employees in the EU-15 and 12 million people working in the EU-25 (Ernst & Young 2006) are estimated to be employed in the eco-construction sector. For Germany alone, a recent study (ifeu et al. 2009) calculated a net increase in employment of 260,000 by 2020 from energy efficiency measures in the energy and transport sectors.

In developing an investment programmes at the EU level, four main strategic fields can be identified:

1. Improving the energy performance of buildings (residential, tertiary, and industry buildings; existing buildings; new buildings; heating and

cooling systems, including the use of renewable energies; smart metering).

2. Reducing the energy use of electrical appliances.

3. Reducing energy use and emissions in industrial processes.

4. Making European electricity grids more flexible.

(1) Strategic Field 1: Improving energy performance of buildings

In order to increase the rate and quality of refurbishments in existing buildings as well as the energy performance of new buildings, the provision of information and low-interest loan schemes combined with advisory schemes has been the predominant (and most effective) approach chosen in Member States (Schüle et al. 2009), although consumer surveys indicate that direct subsidies could be more effective than soft loans. One example of a low-interest loan scheme is the German CO_2 Building Retrofit Programme of the German Federal Reconstruction Loan Corporation (Kreditanstalt für Wiederaufbau), which focuses on both improving the energy performance of buildings themselves and improving building installations, including the use of renewable energies and CHP supply systems. Some Member States also offer incentive programmes complementary to loan schemes, such as household tax deductions or direct subsidies for buildings with a high level of energy performance. Direct subsidies for very energy-efficient buildings or retro-fits have recently also been added, for example to the German programmes. Despite marked successes, however, there is still the challenge of significantly increasing retro-fitting rates and the energy performance of existing buildings through additional investment programmes at EU level.

Accelerating retro-fitting rates and improving the energy performance of existing buildings

For existing buildings (residential, public, commercial, industrial), Member States should be required to achieve the renovation of at least 3% of the building stock each year to comply with low-energy standards. The instruments used should be a matter for the Member States. Additional funding in the framework of a green investment programme should include the following elements:

1. In order to accelerate retro-fitting rates and simultaneously achieve higher standards in retro-fitting, we recommend launching schemes which offer homeowners and SMEs advisory service vouchers. Independent advisory services play a crucial role in raising awareness in the residential and business sector. Such services are usually comprised of a technical diagnosis of the current energetic performance of the building, recommendations on energy-saving measures and information on funding opportunities. Related research showed that advisory services can contribute significantly to both the implementation of additional energy-saving measures when property owners are planning refurbishments and to the implementation of measures to achieve a *higher* energy performance. To avoid simply implementing an isolated additional advisory scheme, the provision of advisory service vouchers should be closely linked to existing labelling schemes (energy certificates) and existing (initial and in depth) advisory schemes at Member State level.

A special focus should be placed on:

- multi-family houses (especially those made of precast concrete slabs in CEEC Member States);
- one-family houses ;
- public buildings (administration and school buildings);
- service-sector and industry buildings.

2. As well as advisory service vouchers, additional grants should be offered directly to support the use of renewable energies and achieve high energy-efficiency standards in the refurbishment of existing buildings.

3. As regards increasing energy performance standards in existing buildings, the R&D challenge now is to implement passive house or zero-emission house standards. Intelligent combinations of high energy performance standards for the building itself and the use of renewable energies are required to significantly reduce energy consumption and emissions from this sector. In the short term, thus, an investment programme at EU level can address this challenge by funding pilot projects in which existing buildings move towards *passive house or zero emissions house standards* in the residential, public, service and industry sectors. Apart from the financial dimension, the implementation of high energy performance standards in existing buildings requires complementary control schemes and training measures for planners, architects, craftsmen and producers of construction materials.

4. In order to extend the focus from an isolated building perspective to urban zones and environments, additional green investment programmes should support cities and regions to develop concepts and pilot projects of zero-emission zones or zero-emission cities. A study by the Wuppertal Institute (2009) demonstrates, using the example of a growing urban quarter in the city of Munich, that an integrated combination of ambitious efficiency measures in existing buildings, high energy performance standards for new buildings (plus-energy houses) and an extensive use of renewable energies (in the case of Munich, especially solar and geothermal energy) can reduce emissions radically in the long term. This example shows that existing district heating systems can be integrated in such an urban or zone-based strategy.

Achieving Zero Emission and Passive House standards in new buildings

Minimum performance standards for new buildings and low-interest loan or subsidy schemes for energy-efficient buildings have been the most common policy approach towards the new building sector. Denmark, for example, has tightened the energy requirements in its building regulations for new buildings by 25-30% as of 2006 (app. 25% by 2010). The UK has improved its energy efficiency standards so that new buildings built in 2007 are 40% more efficient than those built in 2002. The UK is also envisaging making all homes in England carbon neutral ("carbon zero") by 2016, according to its National Energy Efficiency Action Plan. The recasting of the European Buildings Directive will also have a major role to play in improving standards for all kinds of buildings (residential, public, commercial and industrial) to passive-house levels as a first step and net-zero energy levels as the second.

In order to support this process through green investment programmes, two types of pilot projects should be funded at EU level:

1. Financial support for energy-plus houses provides both an example and experimental area for new buildings in general. Energy-plus houses produce more energy from renewable sources on average over the course of a year than they import from external sources. The links between high energy performance standards in building structures and the use of renewable energies or decentralised energy supply systems (e.g. CHP) for heat and electricity need to be addressed.

2. The integration of low emission strategies in buildings with resource efficiency requires further external financial support. Labelling systems like BREEAM, CASBEE, Effinergie, DGNB and LEED can help raise awareness of the materials used and life-cycles in new buildings. Additionally, buildings certified with such labels provide incentives and political support to improve energy related labelling schemes in EU Member States.

3. In the new building sector as well, the perspective should be extended from single buildings to entire urban areas and environments (see above). In the context of a green investment programme, cities and municipalities could be financially supported in planning and implementing settlements with net-zero energy or energy-plus houses.

Optimising energy consumption in heating, and air-conditioning, and lighting systems

Reducing the energy consumption of heating, air-conditioning, and lighting systems is another factor in significantly reducing buildings-related emissions. Old and inefficient heating systems should be replaced or modernised with the help of direct EU grants. Energy-efficient motor technology, for example, can reduce electricity consumption by circulation pumps and fans by up to 80%. Similar energy savings are possible in tertiary and industrial lighting systems, through efficient luminary-ballast-lamp systems combined with daylight and/or occupancy controls. In order to accelerate the modernisation and optimisation of heating, air-conditioning, and lighting systems, the following supporting measures are recommended:

- replacement of old and inefficient heating systems, especially electric heating;
- further promotion of renewables in heating systems (solar thermal collectors, biomass boilers) and air conditioning sytems (solar cooling) in energy-efficient buildings;
- support for a significant market diffusion of energy-efficient circulation pumps and fans as well as implementation of quality control schemes for existing heating systems (e.g. hydraulic adjustment);
- support for a significant market diffusion of energy-efficient lighting systems;
- reduction in net losses in district heating systems in CEEC countries (example: the national energy efficiency action plan of Bulgaria).

(2) Strategic Field 2: Reducing Energy Use of Electrical Appliances

To reduce the energy use of electrical appliances, information and labelling schemes such as the EU labels for appliances have been the most common way to increase awareness and influence purchases in this sub-sector. In a few rather rare cases, financial incentives in the form of fiscal measures or demand-side management programmes have been provided. A++ labelled refrigerators and freezers save around 45% of electricity compared to Class A models, which are the market standard. The market penetration of such efficient appliances is, however, still very low. Reducing the on-mode consumption of office, communication, and entertainment appliances could also be given more financial support enabling a faster market transformation. This will both accelerate the transition to the phase when the EuP standards come into force and promote even more energy-efficient appliances.

The following measures are recommended:

- supporting programmes for the most energy-efficient white appliances;
- supporting programmes for office, communication, and entertainment appliances without a stand-by function and with low on-mode consumption.

(3) Strategic Field 3: Reducing emissions in industrial processes

Loan schemes, grants or direct subsidies for the promotion of energy efficiency actions and renewable energies in industry are offered in many Member States. Besides direct financing measures such as grants or loan schemes, some countries allow tax rebates for investments in energy efficiency, as documented for example in the Belgian and French National Energy Efficiency Action Plans. Another example is the Dutch Energy Investment Deduction (EID), which offers extra tax breaks in the form of additional deductions on taxable profit in return for investments in energy efficiency. In the UK, the Enhanced Capital Allowances (ECA) scheme gives businesses in the tertiary sector a 100% tax allowance in the first year on designated energy efficient equipment investments. In most cases, the financial support for energy efficient appliances is complemented by incentives targeting the promotion of renewable energies or combined heat and power (CHP). The Netherlands has an energy tax in the form of a levy on energy consumption and covers all sectors (also Germany). Since 1999, Finland has supported energy-saving investments by private-sector companies through subsidies (new technologies: 25-35%; conventional technologies: 15-20%, valid only for companies that joined the national energy conservation agreements). Subsidies will also be part of the new energy-efficiency agreements concluded for the period between 2008 and 2016.

Following on from this, an EU-based funding scheme should support such measures, while leaving Member States free to decide how to implement them. A combination of free or subsidised energy audits (advisory and audit vouchers), regional and/or sectoral networks and sectoral energy schemes (as in North Rhine-Westphalia), energy services, and targeted financial support programmes to promote end-use actions identified in the sectoral networks or schemes, appears to be the most successful package for stimulating energy efficiency in SMEs. All of this should be organised and financed in the Member State by national, regional, and local energy agencies, with financial support from the EU in the framework of a green investment programme.

(4) Strategic Field 4: Improving Electricity Grids and Smart Metering in the EU

Diffusion of Smart-Metering Systems

Recent EU regulation, especially the Directive on energy end-use efficiency and energy services (ESD), has clearly emphasised the role of smart metering systems in reducing energy consumption and CO_2 emissions. The majority of existing electricity and gas meters are either not accessible for consumers or provide limited information only. The direct monitoring of energy consumption

through smart metering systems can stimulate energy saving by consumers and offers the possibility of additional energy-related load management services. So far, however, in most Member States only pilot projects have been designed and implemented, predominantly in co-operation with energy suppliers and energy service companies. The design of a European investment programme of smart metering systems, would therefore help achieve the goals of:

- promoting awareness of energy consumption, energy costs and greenhouse gases emissions among consumers;
- stimulating consumers to monitor energy consumption and to take additional action to save money on their energy bills, provided they receive advice on what action they could take and its benefits;
- decreasing the running costs of metering and billing;
- creating the technical ability to cope with peak demand and the integration of renewable energy sources.

Developing Smart Grids

Spreading smart-metering systems also requires the European electricity grid to be improved and made more flexible. The current structure of the European grid is also challenged by general developments in the energy supply market, such as the changing energy mix in Europe, the integration of decentralised renewable large supply systems, and the integration of large-scale offshore wind and concentrated solar power plants. Only innovative and smart grid technologies will be able to manage these strategic challenges and realise the potential for further energy conservation.

The European Technology Platform Smart Grids developed a comprehensive research agenda which provides important elements for delivering a green investment programme in this sector (CEC 2007c). Five research opportunities are identified in this context:

- smart distribution infrastructure (small customers and network design);
- smart operation, energy flows and customer adaptation (small customers and networks);
- smart grid assets and asset management (transmission and distribution);
- European interoperability of smart grids (transmission and distribution);
- smart grids cross-cutting issues and catalysts.

Pilot projects could be funded by a European investment programme to improve European grids to make them more flexible and stable.

6.3 Resource Policy – Problems and Challenges in the European Union

Europe depends on a wide variety of natural resources from domestic sources, as well from other parts of the world. Rising global demand from emerging economies and the scarcity of natural resources will limit access to resources (e.g. metals) and drive up prices.

The significant potential to reduce costs is therefore a strong economic argument and a main driver for resource efficiency, with two major effects: improved competitiveness and job creation. Resource productivity could therefore be a core element of a Green New Deal which would not only have a short-term impact but also mean a stronger economy overall.

Aspects of resource scarcity, resource productivity, competitiveness and jobs creation will now be discussed in more detail.

6.3.1 Risks and impacts of resource use

Since the1980s, total global extraction of both abiotic (fossil fuels, minerals) and biotic (agriculture, forestry, fishing) resources has increased steadily. Between 1980 and 2005, resource extraction levels grew from 40 to 58 billion tonnes. A total of about 80 billion tonnes is predicted by 2020 - 200% of 1980 figure (Giljum et al. 2008). While the global share of extraction by the BRIICS countries (Brazil, Russia, India, Indonesia, China and South Africa) and the rest of the world (non-OECD) is increasing, the global share of the OECD countries is shrinking (figure 19).

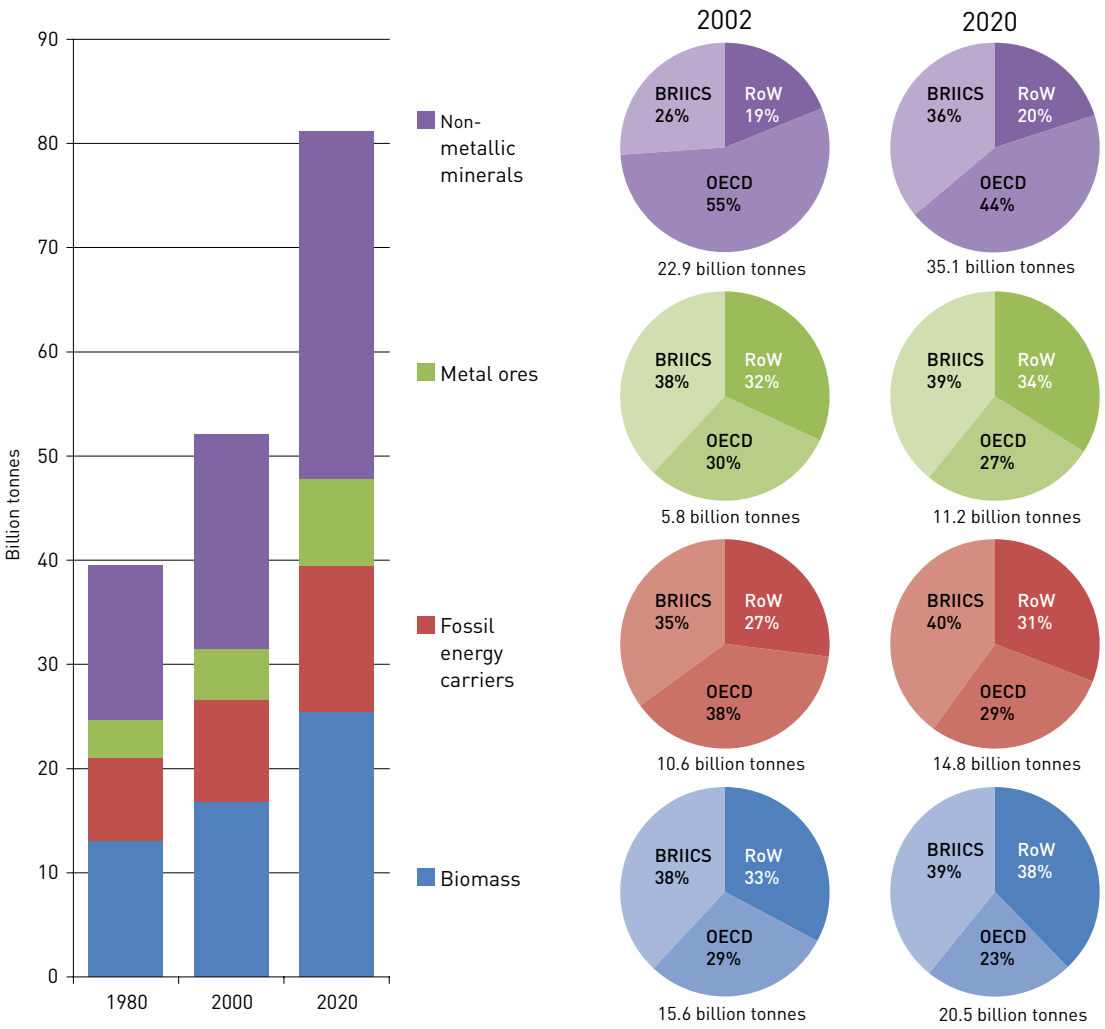


Figure 19 Development of global resource extraction by major groups of resources (SERI Global Material Flow Database (www.materialflows.net); Giljum et al. 2009) and by regions (OECD 2008)

Although the EU's own resource extraction is decreasing, it remains a major extractor. In general, OECD and EU-25 demand is higher than extraction rates (Giljum et al. 2008), while resource-exporting countries tend to extract more than they consume. Thus there is a net transfer of natural resources to the OECD countries and the EU-25.

The EU-25 needs to import about 21% of its resources for the production of goods for final demand, which underlines the EU's dependency on the extraction of natural resources in other parts of the world (Giljum et al. 2008). This dependency cannot be alleviated by expanding domestic extraction as deposits of natural resources are limited in the EU (Bleischwitz et al. 2009b).

Europe's dependency on other countries will thus increase in cases where resources are strategically important and not available on EU territory. This dependency will intensify as the relevance of the OECD countries for future global resource extraction is shrinking (see figure 19).

Increasing global demand for resources in the years before the economic crisis led to an enormous increase in raw material prices. Countries with relative resource scarcity are facing growing competition for resources. If global demand increases again after the crisis, access to resources on world markets would become more difficult and expensive (Bleischwitz et al. 2009b).

In addition to economic risks, overseas resource extraction coupled with ecological risks contribute to an environmental burden-shifting from Europe to other regions of the world.

In addition, more natural resources are being used than the environment is able to regenerate. As a result, natural habitats are being destroyed, biological diversity is dramatically reduced, air, water and soil polluted etc. In short, increased efficiency in using non-renewable and renewable resources decreases the overall pressure on the environment.

6.3.2 Resource productivity and competitiveness

Cost arguments support a positive correlation between resource productivity and competitiveness. Companies which spend less on resources have lower production costs. According to the German Federal Statistical Office, the share of materials as a proportion of overall costs in German manufacturing industries increased from 37.4% to 42.9% between 1995 and 2006, while labour costs decreased from 24.7% to 18.2% (see figure 20).

These figures imply that for reducing costs in manufacturing industries, resource costs have become more significant than labour costs. We may assume that natural resources have also become more relevant for improving overall competitiveness.

Bleischwitz et al. (2009b) support this assumption with a positive correlation between resource productivity and competitiveness among countries in the EU-25. The study correlated the Growth Competitive Index of the World Economic Forum (2002) against the resource productivity of EU economies (figure 21). A regression analysis identifies resource productivity to be a driver of competitiveness. A central argument of resource productivity as a competitive advantage is the high cost-saving potential in material purchasing and transformation, waste handling and energy consumption. Improved quality through radical innovation and reduced environmental impact are also linked to competitive advantages through resource productivity. Finally, improved resource productivity increases planning security, which is also a factor contributing to competitiveness (Bleischwitz et al. 2009b).

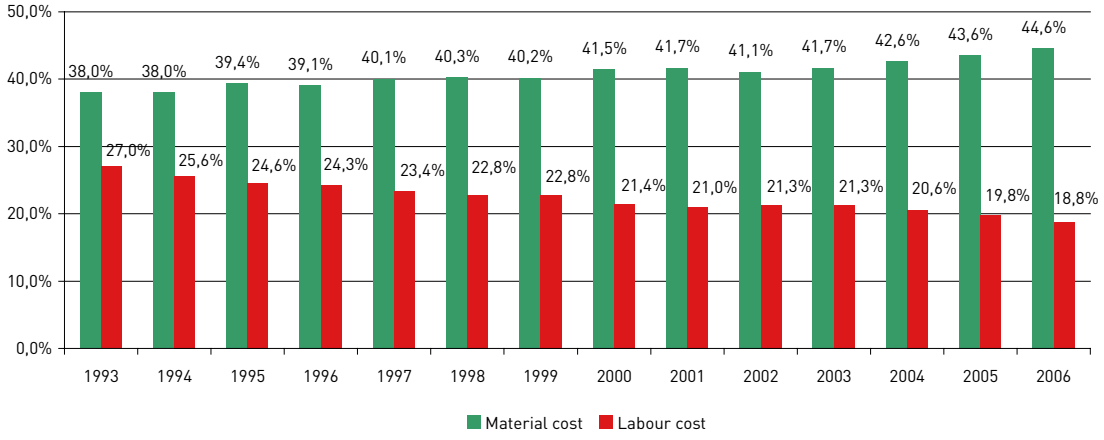


Figure 20 Development of material and labour cost in the German manufacturing industry (Statistische Bundesamt 2008)

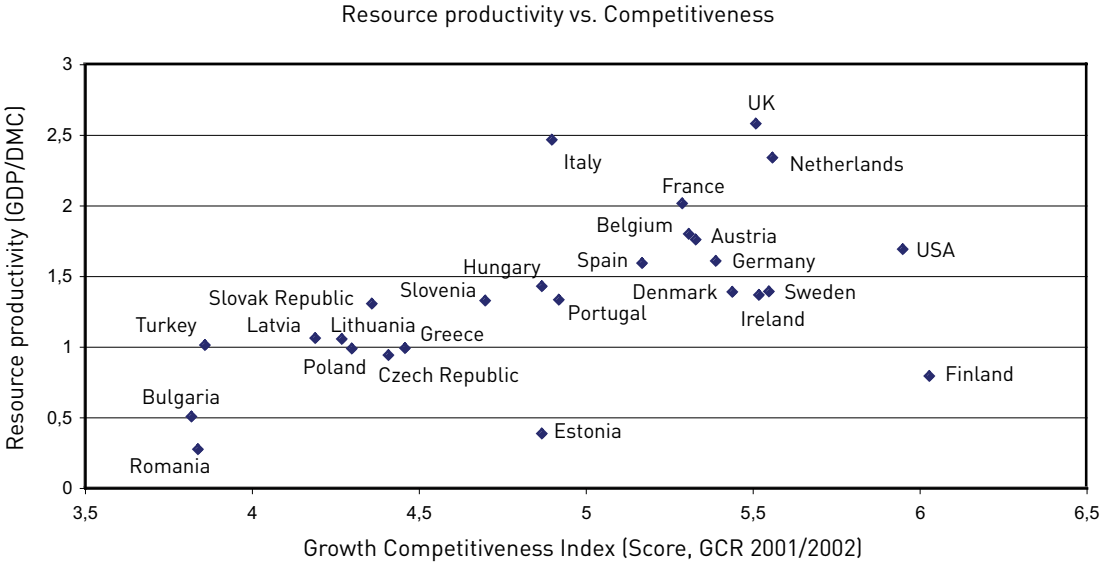


Figure 21 Resource productivity versus competitiveness (Bleischwitz et al.2009b, p.36)

6.3.3 Employment impact of resource productivity

As described above, material costs average about 40% of total costs in the German manufacturing industry, and we may assume similar cost relations in other EU economies. But cost rationalisation in companies often means reduced labour costs and therefore increased unemployment. The cost reductions through increased resource productivity could reduce the pressure on labour and save jobs.

Meyer et al. (2007) have modelled the economic effect of increased resource productivity on the German economy. The so-called Aachener Scenario is based on the assumption of a 20% reduction of material and energy costs in the manufacturing sectors, construction and public administration in 11 years (linearly from 2005 to 2016). The simulation resulted in positive net job effect of 1 million employees by 2016 in Germany alone (ibid).[14]

In summary, by implementing strategies for improving resource productivity the EU could:

- strengthen the security of resource supplies;
- prepare for and avoid increased resource prices;
- take advantage of the competitive advantage of cost reduction;
- realise considerable job-creation potential;
- reduce the overall pressure on the environment significantly.

6.3.4 Strategies of Resource Efficiency Policy

The European Sustainable Development Strategy intends to *"break the link between economic growth, the use of resources and the generation of waste"* (European Commission 2001, p.12). The 6th Environmental Action Programme aims at *"better resource efficiency and resource and waste management to bring about more sustainable production and consumption patterns, thereby decoupling the use of resources and the generation of waste from the rate of economic growth and aiming to ensure that the consumption of renewable and non-renewable resources does not exceed the carrying capacity of the environment"* (European Parliament & Council of the European Union 2002, p.3).

The European Commission uses Domestic Material Consumption (DMC) as an indicator to measure overall resource consumption. The DMC *"measures the total amount of material directly used in the economy. It is defined as all materials directly entering the national economy (used domestic extraction plus imports), minus the materials that are exported"* (European Commission & Eurostat 2005, p.119). The relation of the Gross Domestic Product (GDP) to DMC describes resource productivity (figure 9).

The monitoring of the EU SDS (Eurostat 2005) shows that the EU-15 have already broken the link between GDP growth and resource use

14 The term car-sharing is used in the sense of an organised short-term car-rental, in contrast to private car sharing.

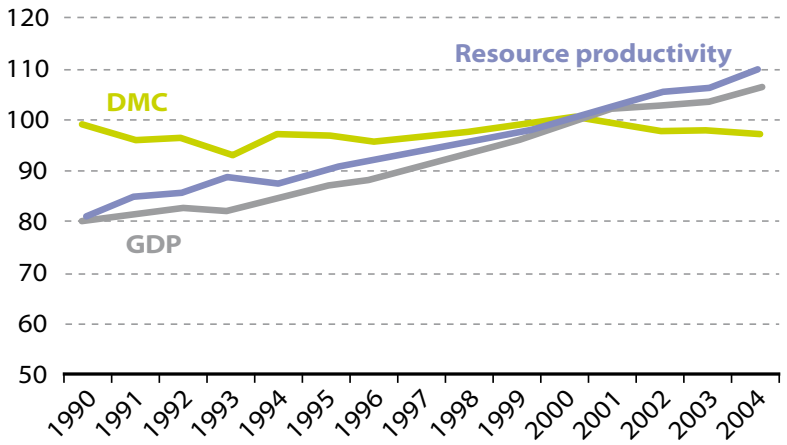


Figure 22 EU-15 DMC versus GDP at constant prices, index 1995=100 (Eurostat 2007)

(figure 22). Although resource productivity is steadily increasing (relative decoupling), Europe's absolute resource use remains at a high level, with economic and environmental consequences see (6.3.1). Policy measure should therefore focus on an absolute decoupling of resource use and economic growth.

DMC as an indicator for resource use does not include hidden flows ("ecological rucksacks") that arise from the extraction or processing of resources. In particular, imported goods are linked to large hidden flows. Europe is currently improving its resource productivity by increasing resource imports. The environmental burden connected to resource extraction is increasingly shifted to other countries (see 6.3.1). Therefore, an indicator should be chosen which includes all hidden flows of resource consumption. Schepelmann et al. (2006) have proposed to the European Parliament using the indicator Total Material Requirement (TMR) to measure the progress of resource efficiency policy.

This leads to consideration of targets. Neither the 6th Environmental Action programme, nor Thematic Strategy on the Sustainable Use of Natural Resources, proposes adequate targets, and the EU lacks concrete measures for achieving improved resource efficiency (Schepelmann et al. 2006).

In contrast to the EU, Germany has adopted the target of doubling raw material productivity by 2020 (excluding biomass and the ecological rucksacks; see Hennicke & Sewerin 2009) compared with 1994 (Federal Government Germany 2002). In this context, a consortium of more than 30 institutes coordinated by the Wuppertal Institute has analysed five objectives in the framework of the "MaRess" study. These five objectives are briefly introduced in the following chapter.

6.3.5 Core objectives for improved resource efficiency

Resource efficiency has to be part of a more comprehensive vision of sustainable industrial societies. Bringezu & Bleischwitz (2009) have outlined what a potentially sustainable resource basis for the EU should look like. They characterise a future sustainable society by four paradigmatic and complementary perspectives:

1. A resource-efficient and recycling-based industrial sector.

2. A steady stocks society, in which the material growth of the economy will be superseded by a dynamic equilibrium between construction and deconstruction.

3. A solar economy using the natural energy supply from the sun; and

4. A balanced bio-economy based on the sustainable use of biological resources.

The dynamics and features of visionary elements which Bringezu & Bleischwitz (2009) have described may provide orientation for technology and policy development.

On a pragmatic and short- to mid-term basis, Kristof & Hennicke (2009) propose five core objectives for the first paradigm of a resource-efficient and recycling-based industry:

1. Sustainable markets of the future – providing a direction for innovation.

2. Strong institutions – key to successful diffusion.

3. Resource-efficient products and services.

4. The Government as consumer – role model and market power.

5. Changes in people's thinking.

Sustainable markets of the future – providing a direction for innovation

Markets should promote innovations with a focus on improved resource efficiency. Political organisation of the market framework conditions should create incentives for the development of resource-efficient innovations and reduce counter-productive incentives. As a result, research and development would be oriented towards resource-efficient solutions and the development of resource-efficient products and services.

Resulting upcoming innovations need to be introduced and established on the market. The diffusion of these innovations on the EU market and exports to international markets needs to be supported by instruments such as support for trade fairs, market information and technology platforms. Existing RTD programmes and technology platforms need adjusting to support resource-efficient solutions and their diffusion on the market.

Strong institutions – key to successful diffusion

Improving the resource efficiency of a company is often difficult. Companies often lack the expertise and the resources necessary to implement resource-efficiency measures. SMEs in particular often lack both the expertise and the time to launch such measures.

To realise efficiency potential, individual and specialised consultancy services are required. These can adapt to the actual situation of a company and follow the whole restructuring process required. This kind of service requires a large pool of consultants. Experience in Germany has shown that an intermediate agent can successfully support cooperation between companies and adequate consultants. The networking German Material Efficiency Agency (Demea) informs public and private institutions about the necessity and benefits of improved resource efficiency, educates and collects consultants, provides access to consultants, and manages networks to provide knowledge exchange and cooperation between different companies, consultants, sectors and regions.

Resource efficient products and services

There are three possible types of political action to support resource-efficient products and services on the market:

- first, in accordance with the first core objective, cutting-edge products need to be supported, especially in the phases of design and market introduction;

- second, standards need to direct average mass market products towards improved resource efficiency. Existing standards like the eco-design directive (2005/32/EG) should be upgraded to include resource-efficiency requirements;

- third, new resource-efficiency standards should also include minimum requirements for products on the market. As a result, products with old, resource-consuming designs will be banned from the market.

The Government as consumer – role model and market power

Strategic consumption can force markets towards more resource-efficient products and services. Governments usually have strong market power since public procurement accounts for a large share of total market consumption. Resource efficiency can be established as an important factor through specific public purchasing directives. This would also be an incentive to design resource-efficient products, since the commercial risk is limited by stable demand from public institutions.

Moreover, governments can play a pioneering role. If resource efficiency is established and consistently applied, long-term cost advantages can be realised. The state can also set an example of socially responsible behaviour.

Changes in people's thinking

The four objectives listed above can only be realised when people (institutions, companies etc.)


© Shutterstock

understand the importance of and opportunities for improved resource efficiency. In order to raise awareness of resource efficiency, all possible communication and education channels have to be used. Young people need to learn in school about resource-efficient behaviour. Later in their education and studies, they should be taught about resource-efficient technologies and services not only to create awareness, but also professional qualifications. In addition, the topic of resource efficiency has to be communicated through specific marketing campaigns. Visualisation of the need for – and benefits of – resource efficiency using best practice examples is essential to support the cognitive process in people's minds. The necessary communication and education process must become part of normal life.

Although improved resource efficiency has remarkable cost advantages and is very important for the security of resource supply, it has to overcome the inertia of a society and a market adapted to high levels of resource consumption. Therefore, political action on a wide scale is needed. For all objectives described above, an analysis of potential and most relevant sectors should be carried out in order to develop an efficient, harmonised and target-oriented policy mix.

6.3.6 Resource Efficiency and Green New Deal

Many of the objectives described in section 6.3.5 require legislative measures and are therefore not compatible with a short-term oriented Green New Deal, but should be treated as mid- to long-term objectives. Ideally, Green New Deal policies should initiate a process of change and help to overcome short-term barriers and disadvantages hampering the achievement of mid- to long-term objectives.

In a first step towards improved resource efficiency, the existing EU-wide expertise should be gathered, assessed and improved where necessary. This could be achieved by establishing a European Resource Efficiency Agency (EREA). Its primary objective would be the development and coordination of Resource Efficiency Agencies and similar agencies in the Member States. The aim would be an EU-wide network of research and technological development for improved resource efficiency. The EREA would initiate international cooperation and communication to raise awareness in Member States and industrial sectors in order to stimulate demand for consultancy services. Awareness of cost-reduction potential among decision-makers in industry would lead to increased demand for specific resource-efficiency technologies, products and services. The desired long-term effect would be self-sustaining competition to achieve the cost advantages of resource efficiency in the

EU's manufacturing industry. This would result in increased demand for scientific and engineering skills which cannot be met by the existing market. Therefore, these measures would have to be accompanied by the creation of the necessary infrastructures for research, training and education. Nevertheless, in the short term, less refined approaches would be sufficient to harvest the "low hanging fruits" by reducing the most obvious resource inefficiencies (see figure 9).

To harvest these "low hanging fruits", the EU regions can build on more than 10 years of experience in existing resource-efficiency agencies. For example, the regional resource-efficiency agency of North Rhine-Westphalia (Effizienz-Agentur NRW – EFA) is providing effective consultancy services. It has established a number of tools to improve production, products, cost accounting and the financing of measures. At national level, the German resource-efficiency agency (DEMEA) provides two basic programmes. The NeMat programme supports networking between companies in order to strengthen their competitive position based on cooperative improvement of material efficiency. The VerMat programme supports the individual consultancy of companies through a pool of consultants.

Alongside the EREA, national **Resource Efficiency Funds (REF)** could be established. These funds would finance resource efficiency, especially in SMEs, which often lack sufficient capital and expertise for resource-efficiency measures. The national REFs could co-finance EU Regional Policy.

Resource-efficient public procurement could be an additional instrument to support resource efficiency directly. Public institutions should improve procurement procedures and assets by investing in resource-efficient products and services.

The combination of an EREA, the availability of funds (national REF + EU Cohesion Funds) and improved public procurement could have a short-term impact on economic development and job creation. Combined with a harmonised, target-oriented policy mix, this could eventually lead to self-sustaining demand for resource-efficient products and services, with a lasting impact on consumption and production patterns (ecological modernisation).

References

ACEA (European Automobile Manufacturers' Association; 2009a): Industry and Economy – Key Figures – Employment. Available online at: http://www.acea.be/index.php/news/news_detail/employment/ (Accessed 28.04.2009).

ACEA (2009b): PASSENGER CARS: Incentives lift European registrations to +2.4% in June. http://www.acea.be/index.php/news/news_detail/passenger_cars_incentives_lift_european_registrations_to_24_in_june/ (Accessed 20.08.2009).

ACEA (2009c): Vehicle Scrapping Schemes in the European Union, Status: 19.05.2009. Available online at: http://www.acea.be/images/uploads/files/20090529_Scrapping_schemes.pdf (Accessed 20.08.2009).

ADEME (Aides à l'acquisition en vue du décollage des marchés, 2009) Available online at: http://www.ademe.fr/auto-diag/transports/rubrique/AidesFinancieres/ DecoMarche.asp#6 (Accessed 20.08.2009).

ARB (Air Resources Board, California Environmental Protection Agency, 2009): Lower-Emission School Bus Program. Available online at: http://www.arb.ca.gov/msprog/schoolbus/schoolbus.htm (Accessed 20.08.2009).

ASES & MSI (American Solar Energy Society & Management Information Services; 2009): Green Collar Jobs report forecasts 37 million jobs from renewable energy and energy efficiency in U.S. by 2030.

ASES / MISI study reveals opportunities, warnings in nation's first update of ground breaking study; hottest sectors: solar, wind, biofuels, fuel cells. Press release of ASES and MSI of January 15 2009.
Automotiveworld (2009): Cash for clunkers' and lifetime CO_2 emissions. By Michael Murphy, August 11, 2009, AutomotiveWorld.com, Available online at: http://www.automotiveworld.com/news/environment/77989--cash-for-clunkers-and-lifetime-co2-emissions (Accessed 20.08.2009).

Berger, R. (2008): Green Tech made in Germany. Umwelttechnologie-Atlas für Deutschland. München: Vahlen.

Bernard, S., Asokan, S., Warrell, H., & Lemer, J. (2009): Which country has the greenest bail-out? Available online at: http://www.ft.com/cms/s/0/cc207678-0738-11de-9294-000077b07658.html?nclick_check=1 (Accessed: 09.03. 2009).

Bleischwitz, R. (Ed.) (2007): Corporate governance of sustainability: a co-evolution view on resource management. ESRI Studies Series on the environment. Cheltenham et al.: Edward Elgar Publisher.

Bleischwitz, R., Giljum, S., Kundt, M., & Schmidt-Bleek, F. (2009a): Eco-innovation. Putting the EU on the path to a resource and energy efficient economy. Wuppertal Spezial Nr. 38. Available online at: http://www.wupperinst.org/uploads/tx_wibeitrag/ws38.pdf (Accessed: 23.04. 2009).

Bleischwitz, R., Hennicke, P. (Eds.) (2004): Eco-Efficiency, Regulation, and Sustainable Business. Towards a Governance Structure for Sustainable Development, Edward Elgar Publisher.

Bleischwitz, R., Steger, S., Onischka, M., & Bahn-Walkowiak, B. (2009b): Ressourcenproduktivität und Wettbewerbsfähigkeit. Potenziale der Materialeffiziens erschließen. Ökologisches Wirtschaften, 2009(2): 35-38.

BMU (Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit; 2009a): Umweltwirtschaftsbericht 2009. Available online at: http://www.bmu.de/files/pdfs/allgemein/application/pdf/umweltwirtschaftsbericht_2009_kurz.pdf (Accessed: 12.03. 2009).

BMU (2009b): 330 Euro Festbetrag macht Nachrüstung von Partikelfiltern attraktiver. Pressemitteilung Nr. 251/09. Berlin, 30.07.2009. Available online at: http://www.bmu.de/pressemitteilungen/aktuelle_pressemitteilungen/pm/44676.php (Accessed: 20.8.2009).

BMU (2008): Ökologische Industriepolitik. Memorandum für einen "New Deal" von Wirtschaft, Umwelt und Beschäftigung. Available online at: http://www.bmu.de/files/pdfs/allgemein/application/pdf/memorandum_oekol_industriepolitik.pdf (Accessed: 13.01. 2009).

BMU (2005): Umwelt und Beschäftigung: Arbeiten im Grünen Bereich. Available online at: http://www.nordschwarzwald.ihk24.de/produktmarken/innovation/Umweltschutz/archiv/archiv2005/Umwelt-Archiv_2005-07/UmweltundBeschaeftigungArbeitenimGruenenBereich.pdf (Accessed: 08.12. 2008).

BMU (2006): Renewable Energy Sources in Figures – National and International Development. Available online at: http://www.bmu.de/files/english/renewable_energy/downloads/application/pdf/broschuere_ee_zahlen_en.pdf (Accessed: 12.12. 2008).

Bringezu, S. & Bleischwitz, R. (2009): Sustainable Resource Management. Global Trends, Visions and Policies. Greenleaf Publisher: Sheffield.

CE Delft (2007): Road traffic noise reduction in Europe. By Eelco den Boer, Arno Schroten. Health effects, social costs and technical and policy options to reduce road and rail traffic noise. Delft, August 2007.

CEC (Commission of the European Communities, 1996): Future Noise Policy. European Commission Green Paper. = COM (1996) 540. Brussels.

CEC (2005a): Sustainable Development Indicators to monitor the implementation of the EU Sustainable Development Strategy. Communication from Mr. Almunia to the members of the Commission. SEC (2005) 161. Brussels.

CEC (2005b): Thematic Strategy on Air Pollution. Communication of 21 September 2005 from the Commission to the Council and the European Parliament. = COM (2005) 446. Brussels.

CEC (2007a): Green Paper: Towards a new culture for urban mobility. = COM (2007) 551 final. Brussels, 25.9.2007.

CEC (2007b): 2010 to be the European Year for Combating Poverty and Social Exclusion. Press Release, IP/07/1905.

CEC (2007c): European Commission. Directorate-General for Research and Directorate Energy. Strategic Research Agenda for Europe's Electricity Networks of the Future. Brussels.

CEC (2008): Cohesion Policy 2007-2013: Environment and climate change. Luxembourg.

CEC (2009a): EU support to fight the crisis in the automotive sector. = IP/09/318. Brussels, 25/02/2009.

CEC (2009b): Background on the situation in the European car industry. = MEMO/09/83. Brussels, 25/02/2009.

CEC (2009c): Cohesion Policy backs "green economy" for growth and long-term jobs in Europe. = IP/09/369. Brussels, 09/03/2009.

CEC (2009d): EU energy and transport in figures. Statistical Pocketbook 2009.

DB Advisors (2009): Global Climate Change Regulation Policy Development: July 2008-February 2009. Deutsche Bank Advisors. February 2009.

Deka Bank (2009): Volkswirtschaft Spezial. Konjunkturpakete - weltweites Aufbäumen gegen die Abwärtsspirale. Available online at: http://www.dekabank.de/globaldownload/de/economics/vowi_spezial/VS_09-03-18_Konjunkturpakete.pdf (Accessed: 24.04. 2009).

Dieselretrofit.eu (2009): Reasons and incentives for retrofitting my truck or my bus. Available online at: http://www.dieselretrofit.eu/incentives.html (Accessed: 20.08.2009).

DWS (2008): Economic Stimulus: The Case for Green Infrastructure, Energy Security and Green Jobs. Available online at: https://www.dws-investments.com/EN/docs/market-insight/R-8217-1_2009_Short_White_Paper.pdf (Accessed: 07.01. 2009).

Ecofys & German watch (2009): Economic/climate recovery scorecards. How Climate friendly are the economic recovery packages? Available online at: www.germanwatch.org/klima/score09.pdf (Accessed: 15.03. 2009).

ECOTEC (2002): Analysis of the EU Eco-Industries, their Employment and Export Potential. A Final Report to DG Environment C1961. Ref: 11/04/02.

EEA (European Environment Agency; 2009): Transport at a crossroads. TERM 2008: indicators tracking transport and environment in the European Union. Copenhagen.

EEA (2006): Agriculture and environment in EU-15 – the IRENA indicator report. EEA report 6/2005. Copenhagen.

EIAG (Environmental Innovations Advisory Group; 2006): Bridging the gap between environmental necessity and economic opportunity. Available online at: http://www.berr.gov.uk/files/file34987.pdf (Accessed: 03.03. 2009).

Ernst & Young (2006): Eco-industry, its size, employment, perspectives and barriers to growth in an enlarged EU. Available online at: http://ec.europa.eu/environment/enveco/eco_industry/pdf/ecoindustry2006.pdf (Accessed: 28.03. 2009).

European Commission & Eurostat (2005): Measuring Progress Towards a more Sustainable Europe. Sustainable Development Indicators for the European Union. Available online at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-68-05-551/EN/KS-68-05-551-EN.PDF (Accessed: 07.04. 2009).

European Commission (2009): Towards a Comprehensive Climate Change Agreement. Commission Working Paper, January 2009. Available online at: http://www.caritas-europa.org/module/fileLib/20090225_CIDSE-CI_Analysis_Communication_Climate_Change.pdf (Accessed: 18.03. 2009).

European Parliament & Council of the European Union (2002): DECISION No 1600/2002/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 July 2002 laying down the Sixth Community Environment Action Programme. Available online at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:242:0001:0015:EN:PDF (Accessed: 12.04. 2009).

Eurostat (2004): EU Member States experience with sustainable development indicators. Working papers, Theme 8 Environment and Energy. Luxembourg.

Eurostat (2005): Measuring progress towards a more sustainable Europe. Sustainable development indicators for the European Union. Data 1990-2005. Panorama of the European Union. Luxembourg.

Eurostat (2007): Measuring progress towards a more sustainable Europe. 2007 monitoring report of the EU sustainable development strategy. Luxembourg.

Eurostat (2009): Energy Statistics. Available online at: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/t_nrg/t_nrg_quant&language=en&product=REF_TB_energy&root=REF_TB_energy&scrollto=0 (Accessed 21.02.2009).

FAZ (Frankfurter Allgemeine Zeitung; 2009): IAB: Konjunkturprogramm kann 250.000 Arbeitsplätze retten. Available online at: http://www.faz.net/d/invest/meldung.aspx?id=94305310 (Accessed: 02.03. 2009).

Federal Government Germany (2002): Perspectives for Germany. Our Strategy for Sustainable Development. Available online at: http://www.ewc2.org/upload/downloads/national_strategy_germany.pdf (Accessed: 03.02. 2009).

FoEE (Friends of the Earth Europe) & CEE Bankwatch (2009): Faster ... but smarter or more destructive? Mapping controversial anti-crisis paths for EU and EIB funding in Central and Eastern Europe. Available online at: http://www.bankwatch.org/billions/index.html (Accessed 12.02.2009).

Giljum, S., Lutz, C., Jennets, A., & Bruckner, M. (2008): Global dimensions of European natural resource use. First results from the Global Resource Accounting Model (GRAM). SERI Working Paper No. 7. Available online at: http://www.seri.at/index.php?option=com_docman&task=doc_download&gid=240&Itemid=39 (Accessed: 12.02. 2009).

Giljum, S., Polzin C. & Lutz, C. (2009): Global implications of a European environmental tax reform. petrE Working Paper, SERI & GWS, Vienna & Osnabrück.

Goossens, Y., Mäkipää, A., Schepelmann, P., van de Sand, I., Kuhndt, M. & Herrndorf, M. (2007): Alternative progress indicators to Gross Domestic Product (GDP) as a means towards sustainable development. Brussels. European Parliament, Policy Department A: Economic and Scientific Policy; DG Internal Policies.

Hennicke, P. & Sewerin, S. (2009): Decoupling GDP Growth ('Quality of Life') from Resource Use: Achievements and Shortcoming of 'Strategic Governance' in Germany. Available online at: http://www.wupperinst.org/uploads/tx_wibeitrag/Decoupling-GDP.pdf (Accessed: 25.08. 2009).

Hennicke, P., Kristof, K., Reutter, O., Thomas, S., & Seifried, D. (2008): Mögliche Bausteine für ein Bundeprogramm Umwelt und Arbeit. Available online at: http://www.wupperinst.org/upload/tx_wibeitrag/Bausteine_Umwelt_Arbeit.pdf (Accessed: 15.08. 2009).

Horbach, J. (2005): Methodological aspects of an indicator system for sustainableinnovation, in: Horbach, J. (ed.) Indicator systems for sustainable innovation, Physica, Heidelberg 2005.

HSBC (2009): A Climate for Recovery. The Colour of Stimulus Goes Green. HSBC Global Research. 25th February 2009.

HWWI (Hamburgisches WeltWirtschafts Institut, 2009): Abwrackprämie auf alles! Von Prof. Dr. Thomas Straubhaar, in: Standpunkt, 14. April 2009. Available online at: http://www.hwwi.org/uploads/tx_wilpubdb/HWWI_Standpunkt102.pdf. (Accessed 20.8.2009).

Ifeu et al. (2009): Institut für Energie- und Umweltforschung, Fraunhofer-Institut für System- und Innovationsforschung, Gesellschaft für wirtschaftlichen Strukturwandel, Prognos AG. Klimaschutz, Energieeffizienz und Beschäftigung. Potenziale und volkswirtschaftliche Effekte einer ambitionierten Energieeffizienzstrategie für Deutschland. Heidelberg, Karlsruhe, Osnabrück, Berlin 2009.

IFW (Institut für Weltwirtschaft der Universität Kiel; 2009): Konjunktur für den Klimaschutz? Klima- und Wachstumswirkungen weltweiter Konjunkturprogramme. Available online at: http://www.ifw-members.ifw-kiel.de/publications/konjunktur-fur-den-klimaschutz-klima-und-wachstumswirkungen-weltweiter-konjunkturprogramme/Konjunktur%20fur%20den%20Klimaschutz.pdf (Accessed: 24.03. 2009).

ISI et al. (2008): Fraunhofer Institut für System und Innovationsforschung, Forschungszentrum Jülich, Öko-Institut, Center for Energy Policy and Economics. Wirtschaftlicher Nutzen des Klimaschutzes. Kostenbetrachtung ausgewählter Einzelmaßnahmen der Meseberger Beschlüsse zum Klimaschutz (Economic benefit of cimate protection. Available online at: http://publica.fraunhofer.de/starweb/servlet.starweb?path=pub0.web&search=N-84057 (accessed 25 August 2009).

ISI et al. (2009): Fraunhofer Institute for Systems and Innovation Research, Ecofys, Energy Economics Group et al. The impact of renewable energy policy on economic growth and employment in the European Union. Available online at http://ec.europa.eu/energy/renewables/studies/doc/renewables/2009_employ_res_report.pdf (accessed at 25 August 2009).

Jänicke, M. & Zieschank, R. (2008): Structure and Function of the Environmental Industry: the Hidden Contribution to Sustainable Growth in Europe. Csge research paper: Anglo-German Foundation.

Jänicke, M. (2008): Megatrend Umweltinnovation. Zur ökologischen Modernisierung von Wirtschaft und Start. München: Oekom Verlag.

Jänicke, M., Kunig, P., & Stitzel, M. (2003): Lern- und Arbeitsbuch Umweltpolitik (2 edt.). Bonn: Dietz.

Koskimäki, P-L (2008): Energy Efficiency Policy and the Importance of Measurement and Evaluation. Presentation given at the Conference "Harmonised Methods for Evaluating Energy End-Use Efficiency and Energy Services". Brussels, October 15 2008. Available online at: http://www.evaluate-energy-savings.eu/emeees/en/events/final_conference/2_Keynote_Koskimaki.pdf, accessed (21 February 2009).

KPMG, (2005): Cost effectiveness of road traffic noise measures. By J. Klooster. The Hague, 2005.
Kristof, K. & Hennicke, P. (2009): Impulsprogramm Ressourceneffizienz: Innovationen und wirtschaftlicher Modernisierung eine Richtung geben: ein Vorschlag des Wuppertal Instituts. Available online at: http://www.netzwerk-ressourceneffizienz.de/fileadmin/user_shares/downloads/Downloads_to_KNOW/MaRess_Policy_Paper_7_2_Kernstrategien.pdf (Accessed: 12.06. 2009).

Lechtenböhmer, S. (2008): Energy Efficiency in Germany and Europe – Chances and challenges for science and economy, Presentation at the FES, Fujitsu Foundation Symposium "Global Energy and Climate Security", Keidanren Kaikan, Tokio.

Lechtenböhmer, S. et al. (2008): How to achieve a domestic 30%GHG emission reduction target in the EU by 2020? On behalf of WWF European Policy Office. Wuppertal 2008.

Mantzos, L. et al. (2003): European energy and transport trends to 2030, published by DG TREN, Brussels.

Mantzos, L. et al. (2005): European energy and transport scenarios on key drivers, published by DG TREN, Brussels.

Martinot, E. & Sawin, J. L. (2009): Renewable global status report. 2009 Update. Available online at: http://www.martinot.info/RE_GSR_2009_Update.pdf (Accessed: 24.06. 2009).

Meyer, B., Distelkamp, M., & Wolter, M. I. (2007): Material Efficiency and Economic-Environmental Sustainability. Results of Simulations for Germany with Model PANTA RHEI. Ecological Economics, 63(1): 192-200.

McKinsey (2009): Pathways to Low Carbon Economy. Available online at: http://globalghgcostcurve.bymckinsey.com/default/en-us/requestfullreport.aspx (Accessed: 09.02. 2009).

OECD (Organisation for Economic Co-Operation and Development; 2009): Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth. Available online at: http://www.oecd.org/dataoecd/59/45/42983414.pdf (Accessed: 04.04. 2009).

OECD (2008): OECD Environmental Outlook to 2030, Paris.

PERI (Political Economy Research Institute; 2008): Green Recovery. A Program to Create Good Jobs and Start Building a Low-Carbon Economy. September 2008.

Porter, M. E. (1991): Nationale Wettbewerbsvorteile. Erfolgreich konkurrieren auf dem Weltmarkt. Munich: Droemer Knaur.

Reid, A. & Miedzinski, M. (2008): Sectoral innovation watch in Europe. Eco-Innovation. Final report. Available online at: http://www.europe.innova.org/docs/SIW_SR_Eco_Innovation.pdf (Accessed: 20.08. 2009).

Saha, D. & von Weizsäcker, J. (2009): Estimating the size of the European stimulus packages for 2009 - An Update. Briefing Paper for the Annual Meeting of the Committee on Economic and Monetary Affairs with the National Parliaments on 11-12 February 2009 at the European Parliament in Brussels.

Schepelmann, P., Schütz, H., & Bringezu, S. (2006): Assessment of the EU Thematic Strategy on the Sustainable Use of Natural Resources. Available online at: http://www.europarl.europa.eu/comparl/envi/pdf/externalexpertise/ieep_6leg/sustainable_use_of_natural_ressources.pdf (Accessed: 14.04. 2009).

Schepelmann, Ph. (2006): Euro-Asian environmental cooperation – a European perspective. In: Welfens, P. et. al. (ed): Integration in Asia and Europe. Historical Dynamics, political issues and economic perspectives, pp. 169-178, Heidelberg.

Schüle, R., D. Becker et al. (2009): Evaluation of National Energy Efficiency Action Plans. Wuppertal, Berlin. available online at: http://www.energy-efficiency-watch.org (accessed 25 August 2009).

SRU (2008): Umweltschutz im Zeichen des Klimawandels. Available online at: http://www.umweltrat.de/02gutach/downlo02/umweltg/UG_2008.pdf (Accessed: 02.04. 2009).

Statistisches Bundesamt (2007): Nachhaltige Abfallwirtschaft in Deutschland. Available online at: https://www-ec.destatis.de/csp/shop/sfg/bpm.html.cms.cBroker.cls?CSPCHD=0000000100004492 5d7U000000D5_kBlehlhLpgAaAhSgYiA--&cmspath=struktur,vollanzeige.csp&ID=1021228 (Accessed: 12.04. 2009).

Statistisches Bundesamt (2008): Statistisches Jahrbuch 2008. Available online at: http://wwwec.destatis.de/csp/shop/sfg/bpm.html.cms.cBroker.cls?cmspath=struktur,vollanzeige.csp&ID=1022321 (Accessed: 15.08. 2009).

Strobl, T. (2009): Europa ist in größter Gefahr. Available online at: http://www.faz.net/s/Rub58241E4DF1B149538ABC24D0E82A6266/Doc~E6EB0A62D419F4943909872B4C2CC1262~ATpl*Ecommon~Scontent.html (Accessed: 18.03. 2009).

Strößenreuther, H. & Halbach, J. (2005): Projekt EnergieSparen im Personenverkehr. In: ZEVrail Glasers Annalen 09/2005, S.356-362.

T&E (European Federation for Transport and Environment; 2009): However you look at it, subsidies for new cars do more harm than good. Available online at: http://www.transportenvironment.org/News/2009/2/However-you-look-at-it-subsidies-for-new-cars-do-more-harm-than-good/ (Accessed: 22.03. 2009).

T&E (2008): EU Actions for Urban Mobility. Response to the public consultation of the European Commission on a new Action Plan on Urban Mobility. Brussels, March 2008.

UITP (International Association of Public Transport; 2009a): Move Green. Green New Deal Workshop, European Parliament, Brussels, 4th March 2009.

UITP (2009b): Public Transports Statistics Report, Issue 1: Latest figures on the urban bus fleet in the European Union. Brussels.

UNEP (United Nations Environment Programme; 2008): Green Jobs. Towards decent work in a sustainable, low-carbon world. Available online at: http://www.ilo.org/wcmsp5/groups/public/---dcomm/documents/publication/wcms_098503.pdf (Accessed: 26.02. 2009).

UNEP (2009): A Global Green New Deal. Available online at: http://www.unep.org/greeneconomy/docs/GGND_Final%20Report.pdf (Accessed: 03.03. 2009).

Unife (The European Rail Industry; 2009): Economic recovery plans and impact on rail projects. Brussels, 27.02.2009.

VCD (Verkehrsclub Deutschland e.V., 2003): Maßnahmen gegen Verkehrslärm. Politische Handlungsansätze für eine leise Zukunft. Bonn.

VDA (Verband der Automobilindustie; 2009): Zahlen und Fakten – Monatsszahlen. Available online at: http://www.vda.de/de/zahlen/monatszahlen/ (Accessed 02.05.2009)
von Weizsäcker, E. U. (1994): Erdpolitik. Ökologische Realpolitik an der Schwelle zum Jahrhundert der Umwelt (4 edt.). Darmstadt: Wissenschaftliche Buchgesellschaft.

WI (Wuppertal Institute for Climate, Environment and Energy; 2008): WI-Report 2008 to the IAB. Wuppertal.

World Economic Forum (2000): Global Competitiveness Report 2000. Available online at: http://www.cid.havard.edu/archive/res/gcr_2000_overview.pdf (Accessed: 25.06. 2009).

Europe in 2009 is confronted with multiple crises – financial, economic, environmental and social. The need for sustainable policies is self-evident. The European Greens are proposing a "Green New Deal", an integrated policy to approach these challenges. The concept tackles the crisis not exclusively as an economic one and calls for the ecological transformation of our economies towards more sustainable and equitable patterns of consumption and production.

The Wuppertal Institute report focuses on the climate, environment and energy aspects of this Green New Deal. It takes stock of the "recovery packages" introduced by governments around the globe and reveals that the European Union is lagging behind the United States and Asia in terms of the Green share of those recovery plans. The authors show the economic and employment potential of a Green New Deal and that the EU has the possibility of leading the way. If it is not to miss this opportunity, the European Union and its Member States must focus their programmes on investments that will kick-start a Green economy and provide sustainable ways out of the crisis.

GREEN EUROPEAN FOUNDATION

15 Rue d'Arlon B-1050 Brussels
T +32 (2) 234 65 70 F +32 (2) 234 65 79
info@gef.eu www.gef.eu

9 789490 515003