

Background Paper

# **Reduction of Coal Subsidies**

**- the results of model-based analysis -**

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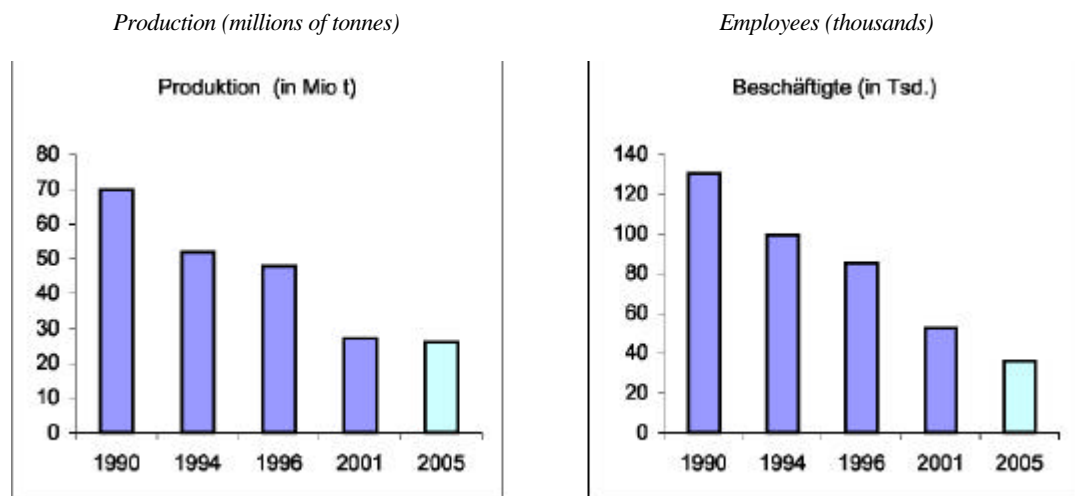
**Background Paper:****Reduction of coal subsidies – the results of model-based analysis**

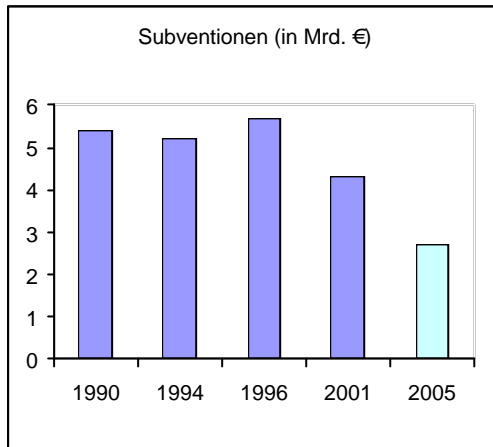
At times when the public coffers are empty, many people call for a reduction in subsidies. The proposals range from cutbacks across the board to the focused elimination of particular subsidies. One of the favourite topics in any discussion about cuts in state aid is the issue of hard coal subsidies.

Government subsidies for the coal mining industry represent almost 30% of all subsidies for trade and industry. Since 1980 alone, around 100 billion euros worth of subsidies have been paid to this sector. Most of the funds have served to artificially maintain the competitiveness of domestic production, the subsidies being used to compensate for the difference in price between German coal, which has high extraction costs, and imported coal, which is up to 70% cheaper.

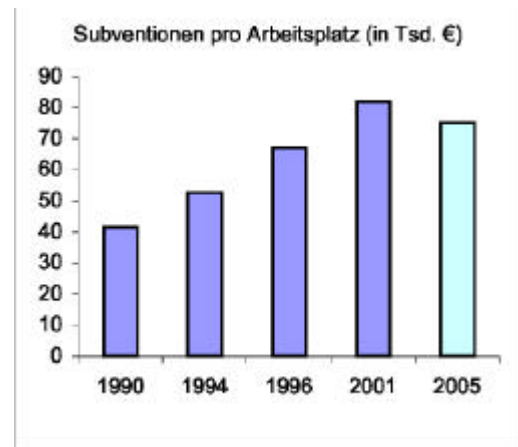
The results of this policy of state aid are sobering. Coal production fell from 87 million tonnes in 1980 to 27 million tonnes in 2001, while the number of employees fell by 72% to 52,600 in the same period. Every job saved in the coal mining industry is therefore dearly paid for. If the sums transferred are divided by the number of persons employed, then each job received an annual subsidy in 2001 of around 82,000 euros. The figures prove that maintenance subsidies cannot solve the fundamental problem facing the German coal mining industry, namely the fact that the high costs of mining under the prevalent geological conditions make it impossible to challenge international competitors, whose costs are lower.

**Figure 1:** Development of hard coal mining from 1990 to 2005





*Subsidies (EUR billion)*



*Subsidies per job (EUR thousand)*

Planned volumes for 2005

**Sources:** German Coal Mining Association, Federal Ministry of Finance (subsidy reports)

### **Key features of state aid**

The Coal Agreement of 1997 fixed Germany's coal policy until the end of 2005. Subsidies from the federal government and regional states are to be gradually reduced to 2.7 billion euros by 2005, with the contribution from the federal budget falling to 2.17 billion euros. This corresponds to roughly half the amount of subsidies paid in 1998. The result will be a drop in coal production to approximately 26 million tonnes and a reduction in the workforce to around 36,000. The new European Union (EU) Council Regulation on State Aid, which entered into force in July 2002, safeguards the German Coal Agreement at European level until 2005.

According to the new EU Regulation, aid for reducing activity may only continue until 2007, by which time a long-term level of minimum production must have been attained that shall initially apply until 2010. At the same time, there must be a downward trend in the total volume of aid granted in the period up to 2010, and the overall result must be a significant reduction in subsidies.

The question of whether and how the coal mining industry may continue to be subsidised beyond 2005 is to be decided this year. The German government's 2002 Coalition Agreement contains the following statement on this point: *'We shall continue the restructuring of the German coal mining industry and safeguard its financing from 2006 to 2010 by negotiating with mining countries, the mining sector and the mining, chemicals and energy industrial trade union (IGBCE). The contribution from the federal budget, which is currently 3.05 billion euros and which will be cut to 2.17 billion euros by 2005, shall continue to fall'*.

The German government intends to retain coal subsidies beyond 2005, albeit at declining levels. There is as yet no fixed plan for reducing subsidies. Proposals include a gradual reduction up to 2020, the retention of an indigenous primary energy base in the form of a limited annual production volume and the complete elimination of subsidies after 2005. The German Coal Mining Association has called for a long-term, coal-based, mixed financing package that would run until at least 2015.

## **OECD and International Energy Agency call for the reduction of coal subsidies in Germany**

The 2001 Environmental Assessment Report for Germany, produced by the Organisation for Economic Cooperation and Development (OECD), arrives at the conclusion that around 35% of German subsidies can be classified as environmentally harmful. Subsidies for the coal mining industry represent a large part of these. The report recommends that the government “... *accelerate the gradual elimination of coal subsidies that is currently under way*”.

The International Energy Agency (IEA) has analysed the energy policies of IEA countries<sup>1</sup>. Several coal-producing countries subsidise their domestic industries, with Germany paying the highest subsidies both in absolute terms as well as per unit of coal produced. The IEA takes the view that today’s coal markets offer adequate security of energy supply. And in response to the arguments of some IEA member countries that cite social and regional factors as justification for domestic coal subsidies, the IEA affirms its belief that there are more efficient ways to support those regions affected by the decline of the domestic coal industry. Its 2002 Review of Germany contained the following statement: “*The German government should continue to reduce coal subsidies with the aim of eliminating them, and set a clear deadline for this abolition. Compensate the loss of the subsidies and resulting decline of the coal industry with restructuring programmes to address social impacts*”.

### **There are clear arguments for reducing coal subsidies**

Coal continues to be needed in Germany as a raw material. Coal-fired power stations and the iron and steel industry require this raw material, while other sectors of industry would be unable to entirely do without it in the long term. This does not justify the continued subsidising of the German coal mining industry, however. The subsidies should gradually be cut back to nothing and the principal reasons for this are as follows:

- **Economic inviability**

Compared to production costs (including transport costs) in other countries, the costs of extracting coal in Germany are so high that the German coal mining industry can only continue to exist if it receives permanent subsidies. This is not a temporary state of affairs, and as no change is expected in the foreseeable future, such a policy would run counter to free market principles.

<sup>1</sup> Australia, Belgium, Denmark, Germany, Finland, France, Greece, Ireland, Italy, Japan, Canada, Korea, Luxembourg, New Zealand, Netherlands, Norway, Austria, Portugal, Sweden, Switzerland, Spain, Czech Republic, Turkey, Hungary, United Kingdom, United States of America.

- **The energy supply is secure even without domestic coal**

Germany already imports more coal than it produces domestically. The production target for 2005 (27 million tonnes) corresponds to approximately 5% of the total energy consumption in the year 2000. According to estimates, Germany has sufficient coal deposits for another thirty to fifty years at most. Domestic coal would not therefore offer a solution to a longer-term energy crisis, while in view of the fact that the current main suppliers of coal are South Africa, Poland, the USA and the CIS, the imported supply seems secure. Plentiful coal deposits still exist, spread throughout the world, and there are large reserves that can be economically exploited. The international trade in coal is well established and highly competitive and the risk of a lasting interruption in supply can therefore be considered minimal. Ultimately, there are other ways and means of increasing the security of supply, for example by using energy more efficiently, diversifying primary energy sources, increasing the proportion of energy obtained from domestic regenerative sources, and actively supporting the European markets for electricity and gas. In cost-benefit terms, the retention of coal subsidies is certainly not the best option.

- **It is possible to compensate for the loss of jobs in the coal mining industry**

It is indisputable that a reduction of subsidies will lead to a loss of mining jobs, yet this is not sufficient reason for retaining the subsidies. The money saved can be invested in employment initiatives for those persons affected, while redirecting a part of the subsidies into projects for ecological modernisation would create new jobs in other sectors of the economy. The results of model-based analysis show that the jobs created by such a strategy can more than make up for those lost in the coal mining industry.

- **Export opportunities for German power station technology are not threatened**

The use of coal in power stations means that the export opportunities for German power station technology are linked to the mining of coal, but not to domestic coal production.

- **A sustainable energy policy requires a change in the energy supply mix**

In order to ensure that energy use is sustainable, i.e. environmentally sound in the long term, it is essential for there to be a sharp increase in the share of energy obtained from renewable sources – such as sun, wind, water and biomass – and for potential energy savings from efficient energy use to be exploited. The need to reduce harmful carbon dioxide (CO<sub>2</sub>) emissions lends these efforts added importance.

The parliamentary commission of the German Bundestag has recommended a target for the concentration of CO<sub>2</sub> in the earth's atmosphere, namely that it should be stabilised at approximately 450 ppm (parts per million) by the end of the century. This means that CO<sub>2</sub> emissions worldwide must be halved by 2050. Analyses show that, based on this premise, there would be a sharp drop in the use of coal in industrialised countries, while coal consumption in Asia would also fall. Total coal consumption would in fact then be at 35-60% of its current level. The importance of coal for guaranteeing a secure energy supply will therefore diminish with time.

This makes it all the more important to redirect aid in order to promote the increased use of renewable energy sources as well as efficient energy use. In the next twenty years, power stations with a total capacity of 40 to 70 gigawatt<sup>2</sup> shall reach the end of their technological and/or political lives. In addition to Germany's nuclear power stations, this includes a significant amount of capacity from coal-fired power stations. In order to meet the target for climate protection, it is essential that part of this capacity is replaced with regenerative energy sources or, even better, rendered unnecessary by energy savings.

- **Negative environmental impact of coal mining**

In addition to the economic absurdity of long-term maintenance subsidies, increasing attention is being paid to the environmental problems caused by coal mining and the associated follow-on costs. Slag heaps have to be sealed at considerable expense in order to prevent contamination of the ground water, dikes have to be built to limit the damage caused by subsidence, the risk of flooding rises and extensive damage is caused to buildings and traffic infrastructure, to name but a few examples. In the past, these negative effects may have been accepted largely without complaint, yet today protest is growing among the local inhabitants who are affected. In 2001, for instance, the opening of a new panel in the Lünen-Werne-Nordkirchen and Walsum-Voerde-Rheinberg regions resulted in the appropriate district authority in Arnsberg receiving around 13,000 objections to the draft general operating plan. Those who have suffered damage as a result of mining activity have formed public interest groups and have, for instance, addressed their demands to the European Commission in the form of a "Brussels Resolution"<sup>3</sup>.

<sup>2</sup> The current total capacity of power stations in Germany is around 115 gigawatts.

<sup>3</sup> Brussels Resolution drafted by the public interest groups BIB (public interest group for those affected by mining in the lower Rhine region) and Fulko (Fürstenhausen-Völklinger union for the restriction of coal mining under inhabited areas), see <http://www.bergschaden-kohlebergbau.de/schwarz/Resolde.htm>

**Excerpt from the “Brussels Resolution” drafted by victims of mining activity in Germany**

The mining of hard coal, which has a considerable impact on people and nature, must be stopped *immediately*.

For example, any further mining of coal below the Rhine – in the case of the Walsum mine, for instance – will lead to “eternal” follow-on costs. Calculations for the current general operating plan that has been submitted have shown that the mining operation will require permanent ground water pumping works with a continuous energy requirement of 330 million kWh per year. This means that the total amount of energy that can be obtained from the 50 million tonnes of coal produced in eighteen years will not even cover the foreseeable energy requirements for the follow-on measures that this mining operation will necessitate.

Mining activities at the Warndt-Luisenthal mine in the Völklingen region take place predominantly beneath heavily populated areas. This has a considerable impact on the settlement and centre of Völklingen-Fürstenhausen, which has 850 houses. Almost 500 houses already have gas alarm systems, while some buildings have been demolished, including three blocks of flats housing 48 families.

The operations at the Ensdorf mine cause seismic disturbances almost every day and night. These are similar to earthquakes and are the cause of considerable alarm for the inhabitants of Lebach and the surrounding area. Extensive mining damage has already occurred and a biotope is under threat.

**Model-based analysis carried out for the Federal Environmental Agency shows that a redirection of coal subsidies would benefit both the economy and the environment**

In order to implement an environmentally friendly aid policy, it is crucial to conduct a lucid analysis of the impact of any reform on the environment, the economy and particular sections of the population. Simulations using econometric models are particularly well suited for evaluating the consequences of a redirection of coal subsidies.

Econometric models that can link environmental and economic data are able to simultaneously show the economic and ecological effects of a reform. The first stage is to formulate a trend scenario that shows what would happen to the economic variables and the variables relevant for environmental protection, such as carbon dioxide emissions, if conditions were to remain the same. This scenario is then compared with a reform scenario, showing for example what would happen if coal subsidies were reduced. A comparison of these two scenarios can result in a whole range of conclusions, for example regarding the net effect in terms of employment, the change in gross domestic product (GDP) and the impact on the environment. In addition to an assessment of the macroeconomic effects, model-based analysis also permits a disaggregated representation of the economic effects resulting from a reform (e.g. the change in gross output broken down by economic sector).

The calculations for the Federal Environmental Agency on the effects of a reduction in coal subsidies were carried out using the Panta Rhei model<sup>4</sup>. The Panta Rhei model is a disaggregated, econometric simulation model and comprises a highly detailed energy and air pollutant model in addition to its economic component. This makes it particularly well adapted to environmental economic analysis.

### **Key features of the modelling procedure**

The reference scenario is based on the assumption that coal subsidies are frozen at 2.7 billion euros after 2005. The reform scenario, on the other hand, supposes a further reduction of subsidies after 2005, leading to their complete abolition by 2010. The following alternative variants are then presented, offering examples of how to use the money thus saved: Budgetary consolidation, support for renewable energy, and funds for building redevelopment.

Each of the simulations assumes, for reasons of simplicity, that the entire amount of money saved is redirected toward one of the alternative uses. This assumption makes it possible to analyse the particular effects of each of the alternatives. A realistic reform proposal for the redirection of subsidies would, however, have to consider the possibility of combining different alternatives, for instance by using part of the money for budgetary consolidation, another part for supporting various ecological modernisation projects and yet another to finance necessary restructuring projects in particularly hard-hit regions.

### ***Variant 1: Use of the funds saved for budgetary consolidation***

The model shows that if the subsidies saved are used for budgetary consolidation, there is a slight drop in employment on a macroeconomic level. This is almost entirely due to the loss of jobs in the coal mining industry, meaning that there would be no negative knock-on effects. At the same time, CO<sub>2</sub> emissions fall slightly compared to the scenario in which subsidies are retained<sup>5</sup>. The model calculations are based on the assumption that, during the period in question (up to 2010), imported coal replaces that which is no longer produced domestically. This assumption is not tenable in the medium to long term as domestic energy sources would substitute some of the coal supply, meaning that the outcome presented here is a worst-case scenario. A substitution by domestic energy sources would both reduce economic losses and enhance the positive effects on the environment. These benefits would be even more apparent if the use of renewable energies and energy-saving measures were to be promoted at the same time.

<sup>4</sup> Environmental data was added to the Panta Rhei model as part of a research project. The findings of the research project shall shortly be available from the Physika publishing house (Frohn, J. et al: "Wirkungen umweltpolitischer Maßnahmen – Abschätzungen mit zwei ökonomischen Modellen").

<sup>5</sup> The research project also examined a further scenario in which the subsidies saved were used to reduce social security contributions. The impact of this was largely comparable to that produced by a redirection of the funds into budgetary consolidation and for this reason a detailed description was not deemed necessary. The effect on employment is more positive, however, as the reduction in social security contributions cuts incidental wage costs, which in turn encourages job creation.

**A redirection of the funds saved to support ecological modernisation both stimulates the economy and protects the environment**

A redirection of funds along these lines would have a positive impact on the environment, boost the economy and result in a net increase in employment, even taking into account the loss of jobs resulting from the reduction of coal subsidies.

***Variant 2: Promote the use of solar power and biomass for heat generation - a cost-effective means of reducing CO<sub>2</sub> emissions***

The increased use of renewable energy sources for heat generation results in a substitution of conventional energy sources such as gas and fuel oil, thereby sharply reducing CO<sub>2</sub> emissions. This produces slight macroeconomic benefits, as investments in construction serve to boost GDP and employment (up by about 9,000). The model also shows a drastic drop in CO<sub>2</sub> emissions – down almost 50 million tonnes by 2010 – thanks above all to the use of biomass for heat generation.

This reduction roughly corresponds to the cuts in CO<sub>2</sub> emissions that, according to the National Climate Protection Programme of 16 October 2000, are required in the manufacturing sector, the energy industry and the transport sector.

***Variant 3: Support an intensive programme of building redevelopment***

Old buildings in particular offer considerable potential for saving energy and thereby reducing CO<sub>2</sub> emissions and heating costs. The German Society for Efficient Energy Use has calculated that, when renovating an average single-family house, the consistent application of structural and technological energy-saving measures could reduce energy consumption by 90%. Support for an intensive programme of redevelopment for old buildings is therefore an important plank in the German government's strategy for achieving its climate protection target. Furthermore, the sector that would benefit from such a programme, namely the construction industry, is labour-intensive and consequently offers high job creation potential.

How does this support work?

Promotion of the use of solar collectors is based on assumptions made in the model calculations whereby subsidies of 87 euros (DM 187) are made available for each square metre of collector surface and that 5,900,000m<sup>2</sup> of collector surface are installed for every billion euros offered in subsidies. It is also supposed that each square metre of collector surface generates 300 kWh of useful heat annually. Promotion of the use of biomass is based on the assumption that appliances generating one kW of heat are installed for every 50 euros of subsidies made available.

In order to offer property-owners an incentive to invest in energy-saving measures, the German government and the Reconstruction Loan Corporation (KfW) launched the “KfW CO<sub>2</sub> Rehabilitation Programme” in January 2001, which will also help create new jobs with excellent long-term prospects in the construction industry and associated trades. The programme supports extensive investments to reduce carbon dioxide emissions and save energy in old residential buildings, i.e. those constructed in 1978 or earlier.

The support for intensive building redevelopment creates an incentive to bring forward renovation work and/or to make additional investments in energy-saving projects, in order to obtain the funding available, as part of work that was already planned. The results of the model-based analysis show that the redirection of subsidies to this end makes both environmental and economic sense. The boost given to the construction industry more than makes up for the loss of jobs in coal mining

How does this support work?

The model-based analysis assumes that the money saved from abolished coal subsidies is redirected into a building redevelopment programme. The key parameters and assumptions regarding the effects of this funding programme are derived from experience with the KfW programmes<sup>6</sup>. It is supposed that the subsidised investments will result in annual savings of at least 40 kilograms of CO<sub>2</sub> per square metre of living space. The level of subsidies is set at up to 255 euros (DM 500) per square meter of living space.

The overall effect of this scenario is to produce a slight rise in GDP and a net increase in employment of around 30,000 by 2010. At the same time, CO<sub>2</sub> emissions fall by approximately six million tonnes. The findings represent a conservative estimate as they assume that only a fifth of the subsidised investments in residential buildings represent extra investments made as a consequence of the funding available.

### **Overview of results of the model-based analysis**

The following overview summarises the results of the model-based analysis for 2010. In each case, the table shows the deviation from the estimated development under the reference scenario, that is the development expected if coal subsidies were to be retained at their 2005 level (2.7 billion euros). The figures therefore show the net impact of reforms.

<sup>6</sup> Between 2001 and 2005 the German government’s Climate Protection Programme will provide a total of one billion euros for these programmes. This funding applies to investments for climate protection in residential buildings. In May 2003, an additional 160 million euros was added to the programme out of eco-tax revenues .

## Overview: The results of model-based analysis for 2010

Deviation from reference scenario	Redirection of hard coal subsidies to support:	
	Heat generation from renewable energy sources	An intensive programme of building redevelopment
Difference in GDP		
- in EUR billion	+ 2.99	+ 4.13
- in %	+ 0.15	+ 0.20
Difference in employment	+ 8,870	+ 30,120
- in %	+ 0.02	+ 0.08
Difference in CO <sub>2</sub> emissions		
- in millions of tonnes	- 49.45	- 5.9
- in %	- 5.61	- 0.67

### Summary

The policy of subsidising coal mining exists on borrowed time. Long-term subsidies for coal mining can be justified neither on economic nor on environmental grounds. It is indisputable that a reduction in coal subsidies will lead to a loss of jobs in the coal mining industry. The social impact can be softened, however, by using some of the money saved to fund socially responsible restructuring projects in the regions affected.

In order to promote sustainable development, at least part of the funds released should be redirected to support ecological modernisation, for example energy-saving investments in buildings or the increased use of renewable energy sources for heat generation.

The model-based analysis carried out for the Federal Environmental Agency shows that a redirection of coal subsidies into ecological modernisation projects makes both economic and environmental sense. Such a reform would, on balance, promote economic growth, create new jobs and sharply reduce environmentally harmful CO<sub>2</sub> emissions.

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