

Annex 2: Case studies for the energy sector

‘Environmentally Harmful Subsidies: Identification and Assessment’

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Task 2: Testing the OECD tools on case studies

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1 NUCLEAR DECOMMISSIONING SUBSIDIES

1.1 Testing the QUICK SCAN MODEL

1.1.1 *Linkage 1 - the impact of the support on the volume and composition of output in the economy*

<p>1. Linkage 1 - the impact of the support on the volume and composition of output in the economy. This identifies the link between the type of subsidy, its point of impact (input, output, profit or income), the price elasticity of demand and supply associated with the activity subsidised and ultimately the impacts on the levels of production and consumption. This in turn is what creates pressure on the environment. The following points are required to describe the linkage.</p>	
<p>1.1. Describe the type of subsidy</p>	<p>Nuclear energy in Germany is subsidised in a variety of different ways. The key subsidy specific to the decommissioning of nuclear-power facilities in Germany is a reduction in tax liabilities stemming from collection of decommissioning funds. Operators of nuclear facilities also benefit from the unrestricted potential of using decommissioning funds.</p> <p>Tax reductions. Operators of nuclear facilities are required to set aside reserves (accruals) for the future disposal of nuclear waste and plant components. The Federal Ministry of Finance considers these requirements as tax-reducing (Palme 2004, cited in Diekmann & Horn, 2007: 37). On a balance sheet, the accruals (liabilities) stand vis-à-vis expenditures (assets), thus reducing the taxable income. This practice is thought to generate very high tax benefits, given that in the past accruals of more than 30 billion EUR have been set aside. The total size of this tax benefit is estimated at 5.6 billion EUR per year or 175 million EUR per nuclear power plant (Diekmann & Horn, 2007: 74). According to Diekmann & Horn, “[in addition to] the interest advantage caused by the temporal shifting of taxes, operators of nuclear facilities may also profit from strengthened internal financing capabilities” (2007: 74). It is unclear whether this tax benefit is specific to the nuclear industry and whether the rules governing the accruals are designed in such a way that operators of nuclear power plants are put at an advantage over other sectors of the economy. The federal government as well as the European Commission have denied such a preferential treatment (Diekmann & Horn, 2007: 39).</p> <p>Unsegregated decommissioning funds. Under German law, adequate decommissioning funds must be available at the time decommissioning begins (EurActiv, 2004). Prior to this, there is not a strict requirement that these funds be set aside in a segregated account and “[thus no] direct link from provisions / liabilities made on the right side of the balance sheets to assets on the left side of the balance sheet” can be drawn (Wuppertal Institute, 2007: 42). In theory, the accumulated funds can be used to finance daily business operations, thereby offering an advantage over competing businesses and industries.</p>
<p>1.2. What is the point of impact of the subsidy?</p>	<p>The point of impact of the decommissioning funds subsidy is on profits (as it is a subsidy to fixed costs). There is little direct relation of decommissioning costs to output (once a plant is commissioned it must be decommissioned).</p>
<p>1.3. What are the intended recipients of the subsidy?</p>	<p>The intent of collect decommissioning funds is to ensure adequate financing for decommissioning. The fact that the nuclear power generators’ activities are subsidised by the decommissioning funds is an unintended side effect but one that has resisted reform.</p>
<p>1.4. Size of the subsidy</p>	<p>The German government does not state in its official publications how much it subsidises decommissioning funds (it does not consider the tax- and interest-free financing opportunities stemming from unrestricted decommissioning funds to be a subsidy).</p> <p>The German government does not in its official publications calculate the level of subsidy stemming from regulations regarding decommissioning funds, so it is</p>

	<p>difficult to determine the effect the subsidy has on the public budget and welfare with the estimated subsidy value varies depending on the source (Meyer 2004: 16). Diekmann & Horn estimate the total size of this tax benefit at 5.6 billion EUR per year or 175 million EUR per nuclear power plant (2007: 74). In a Greenpeace report entitled “Environmentally harmful subsidies and federal tax advantages” 2.4 billion in subsidies and tax advantages to the nuclear industry in 2007 were identified (Greenpeace 2008: 4). The report considered tax benefits for nuclear decommissioning provisions were worth 800 million EUR in 2007 (Greenpeace 2008: 4). According to EUROSOLAR, utilities operating nuclear power plants in Germany accumulate funds amounting to about 30 billion EUR, which can be used for the acquisition of competitors or to enter new businesses (EUROSOLAR 2006). No commitment exists to guarantee that the funds will be available in the future, e.g. following a bankruptcy. EUROSOLAR estimates that the the government sustains an annual loss in tax revenue of up to 20 billion EUR by refraining from taxing nuclear funds for decommissioning (EUROSOLAR 2006).</p> <p>Assessing the adequacy of decommissioning funds is complicated by the fact that neither the government nor private citizens have the legal right to “specific information on planned costs or on accumulated provisions for decommissioning of privately-owned facilities” (Wuppertal Institute 2007:44).</p>
1.5. Description of the sector	<p>Nuclear power plant operators generate electrical power for households and firms. Nuclear power competes with other forms of electricity generation (e.g. fossil-fuel and renewable energy sources).</p> <p>Electricity is for the most part domestically produced or obtained from neighbouring countries. It is possible that significant quantities of nuclear power from neighboring countries could replace domestic nuclear production as nuclear energy is phased out. Trade of nuclear inputs is mainly through uranium acquisition (a small portion of power-generation costs) and power-plant technology (much of it European). Due to the planned nuclear phase-out, the effects of this particular subsidy can be expected to have little effect on trade.</p>
1.6. Price elasticity of demand and supply of the input and output markets	<p>Demand for nuclear power is inelastic over the relevant price range established by the marginal price for electricity, which is set by the highest-cost producer at any time (rarely nuclear). Supply of nuclear is also inelastic over the short term (and restricted over the long term by political, legal and technical factors). In the case of Germany’s nuclear phase-out, total supply is defined by law as a combined generation cap for the entire industry, which upon being reached means that all nuclear plants in the country must be retired. Were the price of nuclear power to rise above the lower energy price suitable to base-load generation, nuclear power would no longer be competitive with other base-load sources such as coal-fired plants. Nuclear is not technically geared to fulfil the intermittent generation capabilities required of providers of higher-priced peak-load power.</p>

1.1.2 Linkage 2 – The mitigating effect of environmental policies in place

2. Linkage 2 – The mitigating effect of environmental policies in place – which takes into consideration policies and emission abatement techniques. Linkage 2 measures the emissions or environmental impacts that result from a volume of activity excluding those ‘filtered’ by environmental policies.	
2.1. Are there environmental policies in place which mitigate the impacts?	Decommissioning is a necessary step at the end of a reactor’s lifespan and the decommissioning requirement of current facilities cannot be mitigated by other policies. The nuclear phase-out policy of the German government will reduce the level of subsidy over time, with no new plants requiring eventual decommissioning, ensuring the subsidy eventually reaches zero.
2.2. What are the impacts of the environmental policies in	The decommissioning funds requirement is designed to ensure that decommissioning takes place and that it is paid for largely by nuclear operators and their customers. The nuclear phase-out policy will eventually ensure that no new radioactive waste is generated and ensures no new plants will have to be decommissioned in the future.

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1.1.3 Linkage 3 - the assimilative capacity of the affected environment

3. Linkage 3 - the assimilative capacity of the affected environment – which represents the dose response relationship taking into account the assimilative capacity of the environment. This might be a highly site specific factor, particularly when the emissions have predominantly local or regional effects, therefore evaluated through dedicated studies. However, in the case of pollutants that have global effects (like CO ₂ emissions or CFCs) effects are not site specific and general conclusions can be drawn.	
3.1. First, could you describe what the size of the environmental damage is?	<p>Nuclear energy leaves behind a large volume of hazardous waste and so far there is no licensed final repository for high-level radioactive waste from nuclear power plants (BMU 2008). Currently, after decommissioning, the waste is stored in provisional containers. A major nuclear accident would cause catastrophic environmental damage also with profound social and economic effects.</p> <p>Nuclear power is also not a CO₂-free technology. Although CO₂ is not emitted during the operation of a nuclear power plant, emissions are created by uranium mining, uranium enrichment, reprocessing and final disposal (BMU 2008). A report by the Öko-Institut in Freiburg found that “a German nuclear power plant produces between 31 and 61 grams of CO₂ per kilowatt hour, depending on where the uranium comes from” (BMU 2008).</p>
3.2 Could you provide insights on the assimilative capacity of the environment to these impacts?	<p>In practical terms, the environment has zero assimilation capacity for large quantities of radioactive materials. Uranium mining has a very large environmental impact. It is also well known that CO₂ emissions are significantly exceeding the environment’s assimilative capacity.</p> <p>In addition, nuclear reactors produce hazardous waste. According to the World Nuclear Association (2008b), “a typical large (1000 MWe) light water reactor will generate 200 - 350 m³ low and intermediate level waste per year. It will also produce about 20m³ (27 tonnes) of used fuel per year, which corresponds to a 75m³ disposal volume following encapsulation if it is treated as waste. Where that used fuel is reprocessed, only 3m³ of vitrified waste (glass) is produced, which is equivalent to a 28m³ disposal volume following placement in a disposal canister”.</p> <p>Nuclear reactors also have the inherent risk of radioactive leakage due to a nuclear accident. As demonstrated by Chernobyl in 1986, in which 125,000 square miles of land in Belarus, Russia and Ukraine were contaminated with large amounts of radioactive gases and particles, nuclear accidents can have horrific effects on the environment (Fairlie/Sumner 2006: 7). In addition to a great increase in deaths from cancer in the populations of Belarus, Russia, and Ukraine, more than half of Chernobyl’s fallout was deposited outside these countries, mainly in Western Europe (Fairlie/Sumner 2006: 8). The Ukraine, more than 20 years later, is still dealing with the environmental, social, economic, and public health consequences of this disaster (Fairlie/Sumner 2006: 12).</p>

Summary of the results of the application of the quick scan to the case study

<p>1. Is the support likely to have a negative impact on the environment?</p>	<p>Assuming that adequate decommissioning funds could be ensured without the subsidy, the effect on the environment of subsidised decommissioning funds is negative to the extent that it encourages the production of nuclear energy. However, the cap established by the nuclear phase-out policy of Germany ensures that production levels cannot be increased due to this subsidy. Requiring segregated funds would ensure collected decommissioning funds would not be lost (e.g. through bankruptcy), but if one assumes full decommissioning is an unavoidable activity, there is no environmental difference stemming from who pays for it or how (plant operators vs. taxpayers).</p>
<p>2. Does the support succeed in transferring income to the intended recipient?</p>	<p>No--the intent of collecting decommissioning funds is to ensure adequate financing exists for decommissioning and that the decommissioning cost is not borne by the German taxpayers. The fact that the nuclear power generators' activities are subsidised is an unintended side effect.</p>
<p>3. Is the support worthy of further scrutiny to assess whether their reform/removal would benefit the environment?</p>	<p>Due to the planned nuclear phase-out in Germany, reforming decommissioning-funds regulations is less of an issue, as the subsidy does not encourage the creation of new nuclear power facilities. Were the phase-out to be reversed, however, addressing nuclear decommissioning subsidies would be an issue worthy of further scrutiny.</p>
<p>4. What are the impacts on the subsidy on trade? Are they important? How likely it is that if you remove a subsidy in country X, it will have any global environmental impacts?</p>	<p>Electricity is for the most part domestically produced or obtained from neighbouring countries. It is possible that significant quantities of nuclear power from neighbouring countries could replace domestic nuclear production as nuclear energy is phased out. Trade of nuclear inputs is mainly through uranium acquisition (a small portion of power-generation costs) and power-plant technology (much of it European). Due to the phase-out, the effects of this particular subsidy can be expected to have little effect on trade.</p>

Some additional questions on the use of the quick scan

<p>Do you think it possible to use the quick scan and produce credible results without employing a general equilibrium model and environmental impact evaluation techniques?</p>	<p>No, because the environmental benefits of removing this particular subsidy in the German policy/political context are not adequately clear. It is not just this single nuclear subsidy that matters; several nuclear subsidies collectively lead to the existing competitive distortions and environmental effects. The nuclear case is too complicated and the nuanced relationships are not evaluated by the quick scan. The existence of the nuclear phase-out policy simplifies the analysis required as it is an effective means of subsidy reform over the long term. This was made clear through the Linkage-2 analysis in the quick scan (mitigating effect of environmental policies in place).</p>
<p>The quick scan model is based on a closed economy. What type of approach could be suggested to include trade?</p>	<p>Due to the planned nuclear phase-out, the issue of trade does not warrant detailed analysis.</p>

1.2 Testing the CHECKLIST

1.2.1 Step 1 – Does the policy filter effectively limits environmental damage?

<p>Is there an environmental policy filter (e.g. size of tradable quota after subsidy removal; level of standards; production limits; rates of environmental taxation; demand and supply elasticities of taxed item etc) which mitigates the effects of a subsidy in the environment? If effective, the removal of the subsidies will bring no or little benefit. Note this section could usefully build on the information collected for analysing linkage 2 in the quick scan.</p>	
1. Describe the environmental policy filter	Decommissioning is an unavoidable activity, so the question is limited to how it shall be funded. The polluter-pays principle calls for decommissioning to be funded by nuclear power operators and the customers purchasing electricity generated using nuclear power. The replacement policy filter is to ensure that no future decommissioning is required. This is done through Germany's existing nuclear phase-out policy.
2. What restrictions to production, pollution or resource depletion levels result from the policy filter?	The nuclear phase-out policy reduces production, pollution and accident risk significantly over the long term.
3. What will happen to the policy filter once the subsidies are removed? See example on p.90 OECD 2005.	The policy filter (nuclear phase-out) will largely remove subsidies to the nuclear power industry by ending nuclear power generation in Germany.
In the light of the above answers, is the policy filter effective in mitigating the environmental impacts caused by the subsidy?	Yes, the policy filter effectively mitigates environmental impacts of the subsidy by capping production of nuclear power and blocking construction of new nuclear plants requiring decommissioning. The phase-out agreement put a cap of 2623 billion kWh on lifetime production by all of the 19 operating reactors (World Nuclear Association, 2008a). In the absence of the phase-out cap, the subsidy could lead to artificially low prices for nuclear power and greater production levels or even expansion of the number of facilities (answering this more definitively requires economic modelling of the energy market).

1.2.2 Step 2 - More benign alternatives are available now or emerging

<p>Availability of more benign technological alternatives (present or emerging) - comparison of the environmental profile of the subsidised product and probable ones) and how the environmental profile of these and modes of production compare to the previously subsidised ones. It should be noted that, at least for the long term availability, this might require some judgement from the analyst (Pieters, 2003).</p>	
1. Are there technologies and products likely to replace the previously subsidised products and modes of production? • Please note: consider not only domestic technologies/ products but also products/technologies available abroad.	Renewable energy sources already exist that could be used to generate replacement electricity. In addition, technological innovation and economies of scale will create new opportunities and drive down prices. The question of whether renewable energy sources could replace nuclear energy entirely is one related to the energy price that society is willing to pay and the question of to what geographic extent nuclear energy is phased out (i.e. whether this occurs just in Germany, the EU, worldwide, etc.).
2. How do the environmental profiles of these competing products and	Other types of energy that could be used are: solar, wind, offshore wind, hydro power, biomass, and geothermal. These

modes of production compare with those of the previously subsidised ones?	are renewable energy sources that do not emit CO ₂ and do not produce hazardous waste. However, compared to fossil fuels, nuclear power generates significantly less CO ₂ on a full lifecycle basis, leading some to fear that in the short-term, coal and other fossil fuels will be used instead of nuclear as base-load supply sources, actually worsening climate effects. Therefore, although there are renewable energy sources available, they will not necessarily be used instead of nuclear energy unless there are adequate incentives and storage and distribution improvements.
3. Is the implementation of these alternatives hampered by the subsidy under scrutiny? • Highlight here if the subsidy has an impact on trade of more benign technologies coming from third countries. If yes, specify what impacts and how important these are.	The phase-out policy caps the total production of electricity from nuclear power. If the phase-out did not exist, the subsidy could hamper implementation of alternatives and the competitive playing field among energy firms, with nuclear-power firms benefitting from tax- and interest-free financing through the use of decommissioning funds.
4. What is the likelihood of these technologies and products to replace the previously subsidised ones?	Provided that adequate incentives are provided, renewable energy sources and energy efficiency improvements could replace the need for nuclear generation.
In the light of the above, are there more benign alternatives available now or emerging (YES/NO)?	Yes.

1.2.3 Step 3 - Does subsidy conditionality lead to higher production?

Some items under step 3 require the use of general equilibrium models. However the use of such models is beyond the purpose of the checklist. The aim of this point should be to detect whether more detailed analysis is required to understand the wider consequences of subsidy removal - note that this step can usefully build on information gathered for Linkage 1 in the quick scan :	
1. Does the subsidy conditionality lead to higher production? In order to understand this, the following characteristics of the subsidy need to be understood :	
○ the size of subsidy:	The German government does not in its official publications calculate the level of subsidy stemming from regulations regarding decommissioning funds, so it is difficult to determine the effect the subsidy has on the public budget and welfare with the estimated subsidy value varies depending on the source (Meyer 2004: 16). Diekmann & Horn estimate the total size of this tax benefit at 5.6 billion EUR per year or 175 million EUR per nuclear power plant (2007: 74). In a Greenpeace report entitled “Environmentally harmful subsidies and federal tax advantages” 2.4 billion in subsidies and tax advantages to the nuclear industry in 2007 were identified (Greenpeace 2008: 4). The report considered tax benefits for nuclear decommissioning provisions were worth 800 million EUR in 2007 (Greenpeace 2008: 4). According to EUROSOLAR, utilities operating nuclear power plants in Germany accumulate funds amounting to about 30 billion EUR, which can be used for the acquisition of competitors or to enter new businesses (EUROSOLAR 2006). No commitment exists to guarantee that the funds will be available in the future, e.g. following a bankruptcy. EUROSOLAR estimates that the the government sustains an annual loss in tax revenue of up to 20 billion EUR by refraining from taxing nuclear funds for decommissioning (EUROSOLAR 2006).

	See 1.4 in the Quick Scan section for additional information.
<ul style="list-style-type: none"> ○ Elasticities of supply and demand: 	The nuclear phase-out policy caps the total production from nuclear power from German plants. In the absence of the cap, the level of production from nuclear power could be affected by removal of the subsidy. In the absence of a phase-out policy, subsidy removal would also have upstream effects on firms installing new plants. Data regarding the specific effect of this subsidy on nuclear power prices and demand for nuclear power is not available for this subsidy.
<ul style="list-style-type: none"> ○ Duration of subsidy (e.g. when 	Currently there are no plans to terminate the subsidy directly, as the phase-out will terminate it eventually.
<ul style="list-style-type: none"> ○ Conditionality (e.g. output, income, profits or income? On the importance of conditionalities see OECD, 2005 in Pieters pp.79-85): 	<p>The impact of subsidised decommissioning funds is on the profits and income of the nuclear energy companies. Total decommissioning funds are not proportional to how much energy is produced or used.</p> <p>Table 6 (below) states that “decreased profitability due to the subsidy removal will discourage entries...” In the German context, it is no longer possible to build a new nuclear power plant benefiting from the subsidy nor to increase the combined total generation of existing plants. Outside this particular legal context, it is difficult to assess how much this particular subsidy would affect profitability and discourage entry. Were all nuclear subsidies eliminated this would likely have a substantial effect on investments and operation of nuclear plants. As the subsidy to decommissioning funds increases the beneficiaries’capacity to finance investments, at least a portion of the implications for the environment depends on what kinds of investments are financed (i.e. investments in fossil-fuel or renewable generation). That said, the primary issue is the fact that it is the use of nuclear power that is the source of this advantage vis-a-vis other firms.</p> <p>One effect of the nuclear phase-out policy is that adequate decommissioning funds must be collected over a shorter time period (and over less total gigawatts generated), effectively raising the per-unit price of nuclear power.</p>
<ul style="list-style-type: none"> ○ The distribution of market power 	The electricity market is oligopolistic in Germany, with significant concern that a lack of competition leads to artificially high costs to consumers.
In the light of the above points, does the conditionality of the subsidy lead to higher production volumes and therefore rates of exploitation of natural resources?	The environmental effects of the subsidy depend on the use to which the nuclear power generator puts the decommissioning funds collected prior to decommissioning. The nuclear phase-out policy of Germany limits the total future production of electricity from nuclear power, so there is no increase in production stemming from the subsidy.

Summary of the results of the application of the checklist to the case study	
1. Is the subsidy removal likely to have significant environmental benefits?	<p>Removing this particular subsidy would probably not change nuclear power production volumes by much and since decommissioning must happen no matter who pays for it, removing the subsidy has little environmental benefit on its own.</p> <p>A quantitative analysis of comparative energy prices is required to determine how subsidy removal would affect profits and potentially production volumes of nuclear, renewable and fossil-fuel energy.</p>

	Such an analysis would be complicated by the fact that the subsidy allows nuclear-plant owners to finance energy investments that can be either positive or negative for the environment. The economic and social aspects of this subsidy are particularly important (offering an unintended financial advantage to nuclear firms that actually stems from the nuclear sector's need for expensive decommissioning to avoid extremely harmful environmental effects).
2. Is the exclusion criteria system – i.e. YES/NO approach - a valid approach? For example if your answer to the assessment of one step was NO, do you think it was correct to stop the analysis? Explain.	The exclusion criteria system focuses almost exclusively on the environmentally harmful aspects of the subsidy when it is the financial/economic aspect that seems the most compelling reason for reform.
3. Is the support worthy of further scrutiny to assess whether their reform/removal would benefit the environment?	There could be greater quantitative information and analysis undertaken.
4. What are the impacts on the subsidy on trade (what are they, are they important?).	Please include here only any additional considerations coming from the analysis of the checklist (otherwise refer to your answer in linkage 1 point 1.5). Due to the planned nuclear phase-out, trade does not need to be considered (see point 1.5).

Some additional questions on the use of the checklist	
1. Based on the application of the tool to your case study, do you think it possible to use the checklist and produce credible results without employing a general equilibrium model?	No, in this case the checklist does not provide a sufficient picture of the main impacts of the subsidy (economic and competitiveness concerns). An analysis of all nuclear subsidies together would be more appropriate. A microeconomic model would be warranted for energy market analysis.

1.3 Testing the INTEGRATED ASSESSMENT FRAMEWORK

1.3.1 Features Scan

The features scan asks in part what the impacts of a subsidy are or could be expected to be in relation to its stated objectives.	
Subsidy objectives:	
<ul style="list-style-type: none"> • What are the objectives of the subsidy, with respect to its environmental, economic and social impacts? 	The main objective of the subsidy is to ensure that funds will be available for decommissioning. This is important for public safety and health as well as the environment.
Subsidy design:	
<ul style="list-style-type: none"> • Does the policy design avoid problems inherent in long-term existence of subsidies? 	There are currently no plans to remove the subsidy. According to a study by the Wuppertal Institute, an important consequence of the nuclear phase-out agreement and a revision to the German tax law in 1999 is that today “there is hardly any policy space left for changes in the current decommissioning financing system for privately owned nuclear installations anymore” (Wuppertal 2007: 1).
<ul style="list-style-type: none"> • Are the conditionalities right? 	The subsidy is a fixed-cost subsidy and not conditional on energy use or inputs, which reduces the effect on production levels (vis-a-vis a subsidy to variable costs).

See next page

Effectiveness analysis: The effectiveness analysis (i.e. does the subsidy achieve its objectives?) should be based on the stated objectives of the policy. Where such goals are not explicitly stated or cannot be inferred, skip this section. Any environmental or social impacts would be considered unintended and would be addressed in the incidental impacts scan below (section 2 of the integrated assessment). This test is a sort of basic threshold criterion: if the subsidy fails at achieving even those objectives for which it aims then it is in need of reform regardless of its incidental impacts. So this is a powerful argument for reform. Possible sources: studies on macro-economic impacts or studies on micro-economic impacts of the subsidy. Please answer the points below.

<ul style="list-style-type: none"> Does the subsidy achieve the economic impacts that it is expected to achieve? (e.g. correct a market failure; increase the supply of a public good) What effect does the subsidy have on the (public?) budget and on welfare? 	<p>The subsidy is supposed to help utilities with nuclear power pay for decommissioning and waste management. However, the significant financial advantage that stems from use of the large quantity of funds collected is an unintended consequence benefitting the nuclear power industry and its shareholders.</p> <p>The German government does not in its official publications calculate the level of subsidy stemming from regulations regarding decommissioning funds, so it is difficult to determine the effect the subsidy has on the public budget and welfare with the estimated subsidy value varies depending on the source (Meyer 2004: 16). Diekmann & Horn estimate the total size of this tax benefit at 5.6 billion EUR per year or 175 million EUR per nuclear power plant (2007: 74). In a Greenpeace report entitled “Environmentally harmful subsidies and federal tax advantages” 2.4 billion in subsidies and tax advantages to the nuclear industry in 2007 were identified (Greenpeace 2008: 4). The report considered tax benefits for nuclear decommissioning provisions were worth 800 million EUR in 2007 (Greenpeace 2008: 4). According to EUROSOLAR, utilities operating nuclear power plants in Germany accumulate funds amounting to about 30 billion EUR, which can be used for the acquisition of competitors or to enter new businesses (EUROSOLAR 2006). No commitment exists to guarantee that the funds will be available in the future, e.g. following a bankruptcy. EUROSOLAR estimates that the the government sustains an annual loss in tax revenue of up to 20 billion EUR by refraining from taxing nuclear funds for decommissioning (EUROSOLAR 2006).</p>
<ul style="list-style-type: none"> Does the subsidy reach the intended recipients? 	<p>Decommissioning funds are intended to benefit the public good (ensuring adequate private financing of decommissioning). The financial benefits accruing to nuclear power operators are an unintended consequence.</p>
<ul style="list-style-type: none"> Does the subsidy achieve its environmental objectives? 	<p>The subsidy itself does not have environmental objectives (this would only be the case if decommissioning funds were to be inadequate without the subsidy, which is unlikely).</p>

Cost-effectiveness: what alternatives exist for meeting those objectives that might be more cost-effective? In other words, could the objectives of the subsidy be achieved by other, more cost effective policies? Suggestion: one way of doing this is by comparing the cost of subsidy per unit of product with the cost per unit of an equivalent product. Note this step helps set the stage for the analysis of the impacts of policy reform. While collecting new, detailed information on the cost effectiveness of alternative policies, if not readily at hand, can be time consuming and costly, the analyst should at least consider and describe alternative policies

What alternative policies exist for meeting those objectives? Please describe:	Utilities could be required to pay into an external, restricted fund that could be government monitored. In fact, the only EU member states that do not require external management of decommissioning funds are France and Germany (ENDS Europe 2004).
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1.3.2 Incidental Impacts

The analysis of incidental impacts asks what impacts have occurred, or might occur, in areas (environmental/economic/social) not foreseen or targeted in the original subsidy design. The stress here is on long-term, dynamic and international impacts (e.g. this includes any impact of the subsidy on foreign producers – which should be noted in the analysis).

<ul style="list-style-type: none"> • What are the unintended economic impacts of the subsidy? 	The unintended economic impacts are that nuclear plant operators have higher profits and lower financing costs for their activities than would otherwise be the case. The nuclear phase-out policy in Germany effectively blocks any production increase effects from the subsidy by capping total production allowed.
<ul style="list-style-type: none"> • What are the unintended social impacts of the subsidy? • Are there any impacts on social groups in third countries deriving from the existence of the subsidy? If yes, describe them. Are they important? 	The subsidy transfers benefits to owners of nuclear power facilities.
<ul style="list-style-type: none"> • What are the unintended environmental impacts of the subsidy? 	The subsidy contributes to the competitive advantage of nuclear power operators vis-a-vis other energy producers. To the extent expansion of renewable energies are hindered by the subsidy, this has direct negative environmental effects. Conversely, to the extent that fossil-fuel generation would replace nuclear generation this would have negative effects on CO ₂ emissions (and positive effects related to radioactive waste). Given the nuclear phase-out policy in Germany, production volumes are capped and no new plants can be built so there is little effect on decommissioning needs, which is primarily a function of the number and size of plants.

1.3.3 Long-Term Effectiveness

<p>Too often, a subsidy designed to solve a short term problem may easily become the cause of problems in the longer term. In this section, the analyst needs to ask whether the subsidy is merely treating the symptoms of a larger problem, or whether it actually addresses underlying causes. The assumption is that, if the former is true, the subsidy may in fact be delaying necessary structural change.</p>	
<ul style="list-style-type: none"> Is the subsidy designed so as to eventually address the economic underlying problems that gave rise to its creation? 	<p>No, there is no economic rationale to allowing decommissioning funds to be used as a tax- and interest-free financing mechanism for nuclear power-plant owners. A segregated and restricted fund would prevent this unintended benefit.</p>
<ul style="list-style-type: none"> Is the subsidy aimed at addressing underlying social problems or to treat symptoms, and therefore perpetuating a social 'lock-in'? 	<p>No, the subsidy is not aimed at addressing underlying economic problems.</p>
<ul style="list-style-type: none"> Is the subsidy designed to directly address the environmental problems (e.g. problems facing infant industries)? 	<p>No, the subsidy has no discernable environmental benefit. This would only be the case if decommissioning funds would be inadequate without the subsidy (unlikely).</p>

1.3.4 Policy Reform

<p>This is the final stage in the analytical framework. It involves highlighting the costs and benefits of the various options for reform, including outright elimination of the subsidy, phased elimination, changed policy design, and alternative measures. The analyst will also need to ask what sorts of flanking measures might be considered as a palliative complement to the various reform options.</p>	
<ul style="list-style-type: none"> What would be the environmental, economic and social impacts of various scenarios for reform of the subsidy, including outright elimination, phased elimination, and change in policy design? Would they differ from a simple reversal of the incidental impacts discussed above? 	<p>Eliminating the subsidy by creating an external, restricted, government-monitored decommissioning fund would have large economic implications for nuclear power firms. Only a quantitative energy-market analysis could identify the extent of environmental benefit that would stem from subsidy elimination and the specific effects on consumers' energy costs.</p>
<ul style="list-style-type: none"> Where negative impacts are predicted, what sorts of flanking measures might be helpful in addressing the negative impacts? 	<p>To lessen the shock of reform to nuclear power operators, the requirement to put decommissioning funds in a segregated account could apply to future funds collected (rather than calling for the transfer of all collected funds to such an account, or applying a retroactive taxation to the amount collected).</p>
<ul style="list-style-type: none"> What would be the impacts of subsidy reform on trade? Would the removal of a subsidy have spill-over effects, i.e. favouring production overseas, favouring industry moving abroad? And what would be impacts on balance on the environment (please describe your assumptions and base your answer on a literature review – clearly specifying the literature consulted) 	<p>Due to the nuclear phase-out, reforming the subsidy would have an insignificant effect on trade.</p>

Summary of the application of the integrated assessment to the case study	
1. Is the subsidy <u>currently</u> justified by any relevant market failure (<i>such as lack of competition, lack of market transparency, or uninternalised external effects – note these may have been valid reasons for the introduction of a subsidy, but they may have disappeared over time</i>)	The subsidy is not justified by a market failure.
2. If yes, is there an alternative way to tackle that market failure?	Not applicable
3. Is the subsidy <u>currently</u> justified by any strong social concern? (<i>Note: a number of subsidies were launched where there was a strong social concern, although this may not always still be the case.</i>)	No, there is no compelling social concern that the subsidy be continued.
4. If yes, is there an alternative way to tackle that social concern?	Not applicable.
5. Have there already been attempts to remove this subsidy, and if yes, why they failed? (<i>e.g. opposition by vested interests, public perception concerns, lack of political will given negotiating capital</i>)	There have been legal attempts to challenge the lack of a segregated decommissioning fund. These legal challenges failed in EU courts. Part of the political agreement related to the nuclear phase-out policy was to ensure that additional taxes would not be selectively imposed on the nuclear industry (World Nuclear Association, 2008a).
6. Could you make recommendations on possible compensation measures that could be used to palliate impact of removal?	The requirement to collect funds in a segregated account could apply to only the future funds collected, but this is unlikely in the context of the political agreement related to the phase-out policy.
7. What would be the impacts on trade of the subsidy removal? Will it have any global environmental impacts?	Due to the planned nuclear phase-out, subsidy removal would have an insignificant impact on trade

2 VAT REDUCTION FOR DOMESTIC ENERGY IN THE UK

2.1 Testing the QUICK SCAN MODEL

2.1.1 *Linkage 1 - the impact of the support on the volume and composition of output in the economy*

<p>1. Linkage 1 - <i>the impact of the support on the volume and composition of output in the economy.</i> This identifies the link between the type of subsidy, its point of impact (input, output, profit or income), the price elasticity of demand and supply associated with the activity subsidised and ultimately the impacts on the levels of production and consumption. This in turn is what creates pressure on the environment. The following points are required to describe the linkage.</p>	
<p>1.1 Describe the type of subsidy.</p>	<p>This subsidy (VAT reduction for domestic energy) does not really fit into the typology used in OECD (1998, ch. 3), as it is a subsidy to consumption rather than to production. In terms of Table 1 in Section 5, it is an on-budget subsidy to output.</p>
<p>1.2 What is the point of impact (conditionality) of the subsidy</p>	<p>The subsidy is conditional on the consumption of energy by households and by organisations that are not obliged to charge VAT on the products and services that they sell.</p>
<p>1.3 What are the intended recipients of the subsidy</p>	<p>The final consumer of energy.</p>
<p>1.4 Size of the subsidy</p>	<p>The size of the subsidy (for the UK alone) was estimated at € 4.5 billion per year in IEEP <i>et al.</i> (2007, Table 5). At present, it may be somewhat less, due to the temporary decrease of the standard VAT rate in the UK (from 17.5 to 15%, until the end of 2009). On the other hand, energy prices have increased and the size of the subsidy increases proportionally with energy prices, because VAT is an <i>ad valorem</i> tax.</p>
<p>1.5 Description of the sector.</p>	<p>The UK's energy sector is largely liberalised. Competition is promoted by Ofgem (the Office of the Gas and Electricity Markets), which also regulates the natural monopolies (networks). Given these conditions, it is likely that the recipients of the subsidy (the final consumers) are also the actual beneficiaries.</p> <p>There are no import restrictions for the supported commodity (apart from the technical limits imposed by the capacity of transboundary gas and electricity connections). There is no evidence that the support has any impact on trade by affecting international competitiveness. Such an impact is unlikely as the beneficiaries are mostly non-commercial entities and generally not involved in international trade. However, there is an impact on trade to the extent that the higher demand for energy is met by energy imports. This impact may be important as it adds to the UK's and the EU's import dependency for energy.</p> <p>Within the EU the basis for taxation for VAT purposes on the supply of electricity or of gas through the natural gas distribution system to final consumers, is deemed to be the place where the customer effectively uses and consumes gas or electricity (Article 39 of the VAT Directive 2006/112/EC of 28 November 2006). Consequently, the reduced rate in the UK would not be a driver for trade from the UK to the other Member States of the EU.</p> <p>An indirect trade impact may be present as the demand for energy saving materials and appliances is lower than it would otherwise be. Whether this affects international trade depends on the extent to which these goods are imported.</p>
<p>1.6 Price elasticity of demand and supply of the input and output markets</p>	<p>The only relevant price elasticity here is the elasticity of demand for domestic energy. This demand is relatively inelastic, especially in the short term. For the UK, it was estimated by the Department of Trade and Industry (cited in Oosterhuis <i>et al.</i>, 2008) at -0.30 for electricity and -0.35 for gas. Similar estimates exist for other countries. For the long term, higher (absolute) values are found.</p>

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2.1.2 Linkage 2 – *The mitigating effect of environmental policies in place*

<p>2. Linkage 2 – <i>The mitigating effect of environmental policies in place</i> – which takes into consideration policies and emission abatement techniques. Linkage 2 measures the emissions or environmental impacts that result from a volume of activity excluding those ‘filtered’ by environmental policies. Note: Because of the complexity and data requirement difficulties associated with establishing linkages 2 and 3 here just draw qualitative conclusions or quantitative only where possible.</p>	
<p>2.1. Are there any experimental policies in place or emission abatement techniques which mitigate the impacts of the support?</p>	<p>The UK has a number of policies in place that are aimed at reducing residential energy demand, improving energy efficiency, and stimulating the use of renewable energy. These include, among others:</p> <ul style="list-style-type: none"> • The ‘Carbon Emissions Reduction Target 2008-2011’, a statutory obligation on energy suppliers to achieve carbon targets by encouraging households to take up energy efficiency and low carbon measures; • Building regulations, requiring newly built houses to achieve certain energy efficiency standards; • The ‘Warm Front’ programme, providing subsidies for energy efficiency measures to households drawing benefit; • Energy efficiency labels and standards for appliances; • The emissions trading scheme, entailing higher prices for electricity users as the costs of emission allowances are passed on; • The ‘Renewables Obligation’, requiring licensed electricity suppliers to source a specific and annually increasing percentage of the electricity they supply from renewable sources; • A reduced VAT rate on certain energy saving materials and equipment <p>Another important mitigating policy instrument is the EU greenhouse gas emissions trading system (ETS). This system ensures that the total greenhouse gas emissions from the sectors under the scheme are capped. A substantial part of the electricity production sector comes under the scheme. This means that an increase in demand for electricity does not necessarily lead to an increase in CO₂ emissions. If the increase in demand is met by fossil fuelled power plants under the ETS, the additional emissions will have to be compensated elsewhere in the system, and there will be no net increase in GHG emissions. In a broader perspective, however, one might argue that the caps on GHG emissions under the ETS are based on historical emissions, and that these historical emissions would have been lower if the standard VAT rate had applied to electricity. In that sense, the ETS does not mitigate the impact of the subsidy.</p>
<p>2.2. What are the impacts of the environmental policies in place?</p>	<p>The environmental policies contribute to the UK’s obligations and objectives in the area of climate change as well as to other environmental objectives. To what extent they can be seen as measures to compensate or neutralize the impact of the low VAT rate is hard to tell. Many other countries, applying standard VAT rates to domestic energy, have comparable policies in place.</p>

2.1.3 Linkage 3 - *the assimilative capacity of the affected environment*

<p>3. Linkage 3 - <i>the assimilative capacity of the affected environment</i> – which represents the dose response relationship taking into account the assimilative capacity of the environment. This might be a highly site specific factor, particularly when the emissions have predominantly local or regional effects, therefore evaluated through dedicated studies. However, in the case of pollutants that have global effects (like CO₂ emissions or CFCs) effects are not site specific and general conclusions can be drawn. Note: Because of the complexity and data requirement difficulties associated with establishing linkages 2 and 3 here just draw qualitative conclusions or quantitative only where possible.</p>	
<p>3.1. First, could you describe what the size of the environmental damage is?</p>	<p>A rough estimate: given a price elasticity of –0.3 to –0.35, increasing the VAT rate on residential energy use from 5 to 15% would reduce demand by some 3%. CO₂ emissions from households in the UK were</p>

	76.9 Mtonnes in 2006 (source: IEA); in addition, around 30% of the CO ₂ emissions from electricity and heat production can be attributed to households, that is about 60 Mtonnes. The environmental damage in terms of additional CO ₂ emissions can thus be estimated at $0.03 \times (76.9 + 60) = 4$ Mtonnes. The estimate would be lower if one takes into account the fact that a decrease in demand for electricity from large combustion plants does not lead to a net decrease in CO ₂ emissions due to the EU ETS. In addition, there are other environmental impacts from energy use (such as emissions of acidifying air pollutants); these are of course not mitigated by the EU ETS.
3.2 Could you provide insights on the assimilative capacity of the environment to these impacts?	This is not relevant for the present case. Each additional tonne of greenhouse gases emitted (as well as other emissions from energy use) can be supposed to contribute to environmental damage.

Summary of the results of the application of the quick scan to the case study

1. Is the support likely to have a negative impact on the environment?	Yes.
2. Does the support succeed in transferring income to the intended recipient?	Yes.
3. Is the support worthy of further scrutiny to assess whether their reform/removal would benefit the environment?	Yes, although it is uncertain if more precise estimates can be found than the figures given above.
4. What are the impacts on the subsidy on trade? Are they important? How likely it is that if you remove a subsidy in country X, it will have any global environmental impacts?	Apart from the fact that the subsidy adds to the UK's and the EU's trade deficit in energy, any trade effects are unlikely as the subsidy does not affect the commercial sector. The increase in the energy trade deficit may be important (as this issue is high on the political agenda), but is unlikely to have a major impact on global energy markets.

Some additional questions on the use of the quick scan

The OECD 2005 (p.35) criticises the quick scan method, as not so easy to apply method. In particular, the linkages portrayed by quick scan model can be assessed only through the use of general equilibrium models. The technical and resource constraints of policy makers makes it not always possible to use such models and is 'generally necessary to adopt a more pragmatic and simplified approach.

Based on the application of the tool to your case study, do you think it possible to use the quick scan and produce credible results without employing a general equilibrium model and environmental impact evaluation techniques?	Yes, the quick scan seems in this case sufficient to provide a good picture of the main impacts of the subsidy.
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2.2 Testing the CHECKLIST

2.2.1 Step 1 – Does the policy filter effectively limits environmental damage?

Is there an environmental policy filter (e.g. size of tradable quota after subsidy removal; level of standards; production limits; rates of environmental taxation; demand and supply elasticities of taxed item etc) which mitigates the effects of a subsidy in the environment? If effective, the removal of the subsidies will bring no or little benefit. Note this section could usefully build on the information collected for analysing linkage 2 in the quick scan.	
1. Describe the environmental policy filter	See the quick scan, under point 2.1.
2. What restrictions to production, pollution or resource depletion levels result from the policy filter?	The restrictions include the cap on CO ₂ emissions for the electricity (and heat) industry under the EU ETS, building regulations, and energy efficiency standards for heating equipment and household appliances. There are, however, no direct restrictions on energy use by households.
3. What will happen to the policy filter once the subsidies are removed?	This is hard to predict. But at least the filters that are imposed by EU legislation (such as the ETS, building regulations and energy efficiency standards) will remain in place. Moreover, as the UK has committed itself to ambitious greenhouse gas reduction objectives (including a legally binding reduction target of 80% by 2050), it seems likely that most policy filters will remain in place.
In the light of the above answers, is the policy filter effective in mitigating the environmental impacts caused by the subsidy?	The policy filter is partially effective in the sense that residential energy use without the filter would probably be (much) higher. However, this does not mean that removing the subsidy would have no environmental benefits, since most of the filter is likely to remain effective after subsidy removal.

2.2.2 Step 2 - More benign alternatives are available now or emerging

Availability of more benign technological alternatives (present or emerging) - comparison of the environmental profile of the subsidised product and probable ones) and how the environmental profile of these and modes of production compare to the previously subsidised ones. It should be noted that, at least for the long term availability, this might require some judgement from the analyst (Pieters, 2003).	
1. Are there technologies and products likely to replace the previously subsidised products and modes of production? <ul style="list-style-type: none">Please note: consider not only domestic technologies/ products but also products/technologies available abroad.	In the present case, substitution is likely to take place mainly by way of investment in energy efficiency improvements and the purchase of products using less energy. These investments and purchases can involve both domestic and imported goods.
2. How do the environmental profiles of these competing products and modes of production compare with those of the previously subsidised ones?	Generally speaking, each unit of final energy use avoided ('negawattour') can be seen as pure environmental gain. However, in some cases the energy efficient substitute may have certain environmentally undesirable features (e.g. the presence of mercury in compact fluorescent lamps). Nevertheless, the overall environmental desirability of energy saving is undisputed.
3. Is the implementation of these alternatives hampered by the subsidy under scrutiny? <ul style="list-style-type: none">Highlight here if the subsidy has an	Yes, the subsidy makes it financially less attractive to invest in energy saving. To the extent that energy saving technology is imported, this also has an impact on international trade.

impact on trade of more benign technologies coming from third countries. If yes, specify what impacts and how important these are.	
4. What is the likelihood of these technologies and products to replace the previously subsidised ones?	There is a huge unused potential for further improvements in residential energy efficiency. For example, in the adoption of energy efficient household appliances the UK clearly lags behind other large EU Member States such as Germany and France (see Oosterhuis <i>et al.</i> , 2008, Figure 4.4).
In the light of the above, are there more benign alternatives available now or emerging (YES/NO)?	Yes.

2.2.3 Step 3 - Does subsidy conditionality lead to higher production?

Some items under step 3 require the use of general equilibrium models. However the use of such models is beyond the purpose of the checklist. The aim of this point should be to detect whether more detailed analysis is required to understand the wider consequences of subsidy removal - note that this step can usefully build on information gathered for Linkage 1 in the quick scan:	
1. Does the subsidy conditionality (i.e. the point of impact of the subsidy – output, input, income or profit, see Linkage 1 of the OECD quick scan) lead to higher production? In order to understand this, the following characteristics of the subsidy need to be understood:	
○ the size of subsidy:	At present VAT rates in the UK, the size of the subsidy amounts to 10% of the selling price excluding VAT. The total amount is estimated at € 4.5 billion per year (see point 1.4 of the quick scan).
○ elasticities of supply and demand:	See point 1.6 of the quick scan.
○ duration of subsidy (e.g. when were they introduced and do they have a sunset clause?):	The subsidy has been in existence for a long time. In 1994 VAT was introduced on residential energy use, at the reduced rate (then 8%). Before that time, VAT on residential energy use was zero rated. Originally, it was intended to increase the VAT rate to the standard level of 17.5% in 1995, but this was abandoned for distributional reasons. At present there are no plans to terminate the subsidy.
○ conditionality (e.g. output, income, profits or income? On the importance of conditionalities see OECD, 2005 in Pieters pp.79-85):	The subsidy is conditional on, and linearly proportional to, energy use.
○ the distribution of market power (please identify the degree of concentration of factor and goods markets e.g. monopoly, free market):	In 2005, retail supply in the British electricity market was dominated by six large companies which supplied 99% of consumers. Each of them had comparable shares in the retail market. Despite consolidation and reintegration, the supply market still seemed to be competitive. The UK also has a highly competitive downstream gas market. In 2005, the European Commission noted that the UK was one of only five EU countries that had no major issues or obstacles to competition in their gas markets. There are also six players on the gas retail market, but the distribution of market share is somewhat less equal than in the case of electricity: the dominant player (BGT) had a market share of 53% in 2005 (source: IEA, 2006, <i>Energy Policies of IEA Countries, The UK 2006 Review</i>).
	See also point 1.5 in the quick scan.

In the light of the above points, does the conditionality of the subsidy lead to higher production volumes and therefore rates of exploitation of natural resources.	Yes.
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Summary of the results of the application of the checklist to the case study	
1. Is the subsidy removal likely to have significant environmental benefits?	Yes.
2. Is the exclusion criteria system – i.e. YES/NO approach - a valid approach? For example if your answer to the assessment of one step was NO, do you think it was correct to stop the analysis? Explain.	The YES/NO approach may be especially problematic with respect to the policy filter. Environmental policies are ubiquitous, so it will be hard to think of an EHS where no countervailing environmental policy is present. The question is, of course, if the policy filter would also be there (to the same degree) in the absence of the EHS. My personal guess would be that in most cases the answer to this question will be “yes, to a very large extent”. In other words, the presence of the policy filter reduces the environmental damage just a little bit.
3. Is the support worthy of further scrutiny to assess whether their reform/removal would benefit the environment?	Yes, although it is uncertain if more precise estimates can be found than the figures given above. (Same answer as under the quick scan).
4. What are the impacts on the subsidy on trade (what are they, are they important?).	Please include here only any additional considerations coming from the analysis of the checklist (otherwise refer to your answer in linkage 1 point 1.5). Higher level of energy imports; lower level of energy saving technology imports.

Some additional questions on the use of the checklist	
Based on the application of the tool to your case study, do you think it possible to use the checklist and produce credible results without employing a general equilibrium model?	Yes, the checklist seems in this case sufficient to provide a good picture of the main impacts of the subsidy.

2.3 Testing the INTEGRATED ASSESSMENT FRAMEWORK

2.3.1 Features Scan

<p>The <i>features scan</i> asks in part what the impacts of a subsidy are or could be expected to be in relation to its stated objectives.</p>	
<p>Subsidy objectives:</p>	
<ul style="list-style-type: none"> • <i>What are the objectives of the subsidy, with respect to its environmental, economic and social impacts</i> 	<p>The objectives are mainly social and political. The traditional argument to tax ‘necessities’ at a reduced VAT rate (or not to tax them at all) is that low-income households tend to spend a relatively large part of their income on these goods and services, so that taxing them at the standard rate would have a regressive distributional impact. For example, in 1991 (i.e. before the introduction of VAT on residential energy use) the 20% poorest households in the UK spent on average 16.5% of their income on energy, against 6.0% for the 20% richest households (based on figures in I. Crawford, S. Smith and S. Webb, 1993, <i>VAT on Domestic Energy</i>, Institute for Fiscal Studies, London). Meanwhile, however, the situation has changed dramatically, as a result of general income growth, falling net energy prices (for gas by 16.6% over the period 1990-2004, and for electricity by 24.6%; source: DTI, 2005, <i>UK Energy in Brief</i>), more energy efficient dwellings and appliances, and probably also decreasing income inequality. According to Eurostat data, in 2005 UK households in the lowest income quintile spent 3.9% of their total expenditure on energy, and those in the highest income quintile 2.4%. The comparable figures for the EU-27 were 7.1% and 4.5%, respectively.</p> <p>The subsidy has no economic or environmental objectives.</p>
<p>Subsidy design:</p>	
<ul style="list-style-type: none"> • <i>Does the policy design avoid problems inherent in long-term existence of subsidies?</i> 	<p>No; the subsidy is there without any perspective on termination or reform. There is no monitoring to check if it reaches its objective.</p>
<ul style="list-style-type: none"> • <i>Are the conditionalities right?</i> 	<p>The subsidy is conditional on final energy consumption. There are no other conditions.</p>
<p>Effectiveness analysis: The effectiveness analysis (i.e. does the subsidy achieve its objectives?) should be based on the stated objectives of the policy. Where such goals are not explicitly stated or cannot be inferred, skip this section. Any environmental or social impacts would be considered unintended and would be addressed in the incidental impacts scan below (section 2 of the integrated assessment). This test is a sort of basic threshold criterion: if the subsidy fails at achieving even those objectives for which it aims then it is in need of reform regardless of its incidental impacts. So this is a powerful argument for reform. Possible sources: studies on macro-economic impacts or studies on micro-economic impacts of the subsidy. Please answer the points below.</p>	
<ul style="list-style-type: none"> • <i>Does the subsidy achieve the economic impacts that it is expected to achieve? (e.g. correct a market failure; increase the supply of a public good)</i> • <i>What effect does the subsidy have on the (public?) budget and on welfare?</i> 	<p>There are no economic objectives.</p> <p>It reduces the tax revenues by about € 4.5 billion (though it may also reduce the state’s expenditures on social benefit somewhat, as there are less households in ‘fuel poverty’).</p>
<ul style="list-style-type: none"> • <i>Does the subsidy reach the intended recipients?</i> 	<p>Only a small part of the subsidy reaches the intended recipients (low-income households). High-income households receive most of the benefits, as the income elasticity of demand for energy is</p>

	positive.
<ul style="list-style-type: none"> Does the subsidy achieve its environmental objectives? 	There are no environmental objectives.
<p>Cost-effectiveness: what alternatives exist for meeting those objectives that might be more cost-effective? In other words, could the objectives of the subsidy be achieved by other, more cost effective policies? Suggestion: one way of doing this is by comparing the cost of subsidy per unit of product with the cost per unit of an equivalent product. Note this step helps set the stage for the analysis of the impacts of policy reform. While collecting new, detailed information on the cost effectiveness of alternative policies, if not readily at hand, can be time consuming and costly, the analyst should at least consider and describe alternative policies</p>	
<ul style="list-style-type: none"> What alternative policies exist for meeting those objectives? Please describe: 	Direct income support or tax relief for the target group (low-income households) would probably be a far more cost-effective solution.

2.3.2 Incidental Impacts

<p>The analysis of incidental impacts asks what impacts have occurred, or might occur, in areas (environmental/economic/social) not foreseen or targeted in the original subsidy design. The stress here is on long-term, dynamic and international impacts (e.g. this includes any impact of the subsidy on foreign producers – which should be noted in the analysis).</p>	
<ul style="list-style-type: none"> What are the unintended economic impacts of the subsidy 	<p>The unintended economic impacts are likely to be minor. The subsidy does not (directly) change prices of production factors or inputs. There are some obvious impacts on specific sectors (e.g. lower sales levels for suppliers of energy saving products).</p>
<ul style="list-style-type: none"> What are the unintended social impacts of the subsidy Are there any impacts on social groups in third countries deriving from the existence of the subsidy? 	<p>As indicated above, the subsidy on average mainly benefits high-income groups, even though its overall impact is progressive. However, within each income group there are wide variations in energy consumption levels. People with the highest energy use within each income group benefit the most from the subsidy.</p> <p>Specific impacts on social groups in third countries (apart from the impacts related to the shift in trade patterns – more imports of energy and less of energy saving products) are unlikely.</p>
<ul style="list-style-type: none"> What are the unintended environmental impacts of the subsidy? 	<p>These are the environmental impacts related to the production, distribution and use of domestic energy: greenhouse gas emissions, acidification, resource depletion etc..</p>

2.3.3 Long-Term Effectiveness

<p>Too often, a subsidy designed to solve a short term problem may easily become the cause of problems in the longer term. In this section, the analyst needs to ask whether the subsidy is merely treating the symptoms of a larger problem, or whether it actually addresses underlying causes. The assumption is that, if the former is true, the subsidy may in fact be delaying necessary structural change.</p>	
<ul style="list-style-type: none"> Is the subsidy designed so as to eventually address the economic underlying problems that gave rise to its creation? 	No.
<ul style="list-style-type: none"> Is the subsidy aimed at addressing underlying social problems or to treat symptoms, and therefore perpetuating a social ‘lock-in’? 	The subsidy makes investments in energy saving less attractive and therefore tends to preserve the ‘fuel poverty’ that it seeks to mitigate.

<ul style="list-style-type: none"> Is the subsidy designed to directly address the environmental problems (e.g. problems facing infant industries)? 	No.
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2.3.4 Policy Reform

This is the final stage in the analytical framework. It involves highlighting the costs and benefits of the various options for reform, including outright elimination of the subsidy, phased elimination, changed policy design, and alternative measures. The analyst will also need to ask what sorts of flanking measures might be considered as a palliative complement to the various reform options.

<ul style="list-style-type: none"> What would be the environmental, economic and social impacts of various scenarios for reform of the subsidy, including outright elimination, phased elimination, and change in policy design? Would they differ from a simple reversal of the incidental impacts discussed above? 	<p>In this specific case the only realistic reform option seems to be ‘one-off’ elimination, as there is no opportunity to phase the subsidy out by gradually increasing the VAT rate. The VAT increase may be announced well in advance if this would improve acceptance; there is little risk of stocking. The main impacts of the reform would be a reversal of the impacts described above. The impacts will also depend on the choices made with respect to the additional tax revenues. Possible scenarios include:</p> <ol style="list-style-type: none"> Cuts in (other) taxes: The impacts will depend on the tax(es) selected. An interesting option might be to reduce the standard VAT rate, because this has a less regressive impact than for instance reducing income taxes. Given the size of the subsidy, the standard VAT rate could be reduced by 0.5 percentage points (possibly even less) to keep VAT revenues stable. As the UK currently applies the minimum standard VAT rate (15%) on a temporary basis, this option is only available in the future (e.g. by way of an increase to 17 instead of 17.5%). Additional spending (e.g. on targeted subsidies to compensate low-income, high-energy households): This could be done, for instance, by means of an increase in the budget available for instruments such as the ‘Warm Front’ programme (see item 2.1 in the Quick Scan). The budget increase could be used to expand the eligibility criteria, widen the range of investments that qualify for a subsidy, and/or increase the amount of subsidy per measure. This scenario has positive social impacts and leads to additional energy saving and CO₂ reduction (on top of the impact of the VAT increase itself). Other types of expenditure, e.g. increased subsidies for renewable energy, would also have additional beneficial environmental impacts, but are less suitable to compensate those households suffering most from the VAT increase. A reduction in public budget deficits: This may be the preferred option if the timing of the subsidy reform coincides with the general reforms in public finance that may be required after the current recession. This scenario has positive impacts on government finance, but is less beneficial from a social point of view.
<ul style="list-style-type: none"> Where negative impacts are predicted, what sorts of flanking measures might be helpful in addressing the negative impacts? 	<p>There does not seem to be a real need for flanking measures, as the size of the impact is very modest. As noted above, the lowest income groups in the UK spend less than 4% of their total expenditure on energy, so a VAT increase from 5 to 15% would mean less than 0.4% reduction in purchasing power. Consumers are used to much larger price fluctuations than the 9.5% implied in the VAT increase. For example, between 2005 and the third quarter of 2008, the average price of gas and electricity for households in the UK increased by 77% and 57%, respectively (source: IEA). Obviously, the best timing for reform would be in a period of relatively low energy prices.</p> <p>If it is nevertheless deemed necessary to apply flanking measures, the obvious choice would be direct financial compensation to the target group, i.e. low-income households (especially those with a high energy use; mainly elderly</p>

	people). See above under point 1 of this section.
<ul style="list-style-type: none"> What would be the impacts of subsidy reform on trade? Would the removal of a subsidy have spill-over effects, 	<p>The main trade impacts would be a decrease of energy imports and an increase in the imports of energy saving technology. As it leaves the competitiveness of British industry unaffected, the reform would not lead to a relocation of industry abroad.</p> <p>The main environmental impact would be a reduction in CO₂ emissions of around 4 Mtonnes per year (see item 3.1 in the quick scan).</p>

Summary of the application of the integrated assessment to the case study	
1. Is the subsidy <u>currently</u> justified by any relevant market failure (<i>such as lack of competition, lack of market transparency, or uninternalised external effects – note these may have been valid reasons for the introduction of a subsidy, but they may have disappeared over time</i>)	No.
2. If yes, is there an alternative way to tackle that market failure?	N.a.
3. Is the subsidy <u>currently</u> justified by any strong social concern? (<i>Note: a number of subsidies were launched where there was a strong social concern, although this may not always still be the case</i>).	The social motive has largely disappeared, as the share of energy in household expenditure has decreased dramatically, also among low-income households.
4. If yes, is there an alternative way to tackle that social concern?	Even if it is felt that the social motive is still valid, there are various way to address this in a more targeted way.
5. Have there already been attempts to remove this subsidy, and if yes, why they failed? (<i>eg opposition by vested interests, public perception concerns, lack of political will given negotiating capital</i>)	Yes, back in 1995. Failed because of expected distributional impact. Particularly the fact that it would hit elderly people the hardest, led to the abandonment of the proposed increase of VAT to the standard level (R. Fouquet (1995), The impact of VAT introduction on UK residential energy demand, <i>Energy Economics</i> 17 (3), 237-247).
6. Could you make recommendations on possible compensation measures that could be used to palliate impact of removal?	The most obvious way to do this would be by reinforcing existing schemes to assist low-income households with investments in energy saving.
7. What would be the impacts on trade of the subsidy removal? Will it have any global environmental impacts?	A shift in the composition of UK imports from energy to energy saving technology. Global GHG emissions would be reduced by some 4 Mtonnes per year.

3 FUEL TAX EXEMPTION FOR BIOFUELS IN GERMANY

Introduction to the case study

This is a historical case study that focuses on Germany's 2004 fuel tax exemption for pure and blended biofuels and its subsequent reform. While recognising that much has changed since this time and that Member States now operate in a different context where the unintended adverse consequences of biofuels are increasingly recognised and to some extent addressed; it was considered that an analysis of this case would be useful in the current context as Member States begin the process of revising/developing policies to meet new biofuels targets and sustainability criteria.

Context

In Germany the promotion of biofuels is an important element of national renewables policy, and was advocated by the Green Coalition Partner in Government in the early 2000s. At the time that the 2004 tax exemption was introduced in Germany, EU Member States were required under the biofuels Directive (2003/30/EC) to ensure that a 'minimum proportion' of biofuels and other renewable fuels are placed on their markets. A legal provision made in Directive 2003/96/EC on the taxation of energy products and electricity allowed Member States to apply reduced excise duty and tax exemptions for products from biomass sources. The reference values in the 2003 biofuels Directive were not legally binding and its 2005 target was missed in all EU Member States with the exception of Sweden and Germany. The EU has subsequently developed robust legislation encouraging the use of biofuels in the transport sector which integrate some sustainability criteria that aim to prevent, or at least mitigate, the impacts associated with increased demand for biofuels. Under Directive 2009/28/EC on the promotion of the use of energy from renewable sources only those biofuels that fulfil minimum sustainability criteria will count towards the EU and Member State targets and renewable energy obligations, and be eligible for certain forms of financial support. While it is still far from clear that these provisions will effectively account for the sustainability of any given batch of biofuels (with a number of outstanding concerns related to indirect land use change, implementation etc), they arguably provide some general positive pressure / incentives for improving environmental and social standards in producer countries and as such are an important environmental policy filter.

In the coming months Member States are expected to begin the process of revising existing policies / introducing new measures to promote biofuels to comply with the provisions of the new Directive. In this context, an examination of the German case is valid given the size of the domestic market, the strong history of political support for biofuels, the impacts of this support, and its reform since 2006. An analysis of the German experience in reforming its biofuels support measures is expected to provide some interesting insights which may be useful for the policy reform process underway in other EU Member States.

Caveat

Given the complexities related to the issue of biofuels, it is worth keeping in mind certain caveats when reading the results below. In particular, it is important to note that tax exemptions are one instrument used in pursuit of biofuels policy objectives. In this context, it is difficult to extrapolate the specific environmental, social and economic impacts of the tax exemption from the impacts of other instruments that also seek to meet biofuels policy objectives per se. Tax exemptions are not a stand-alone subsidy, and interactions with other instruments, as well as wider biofuels policy objectives and agreed targets should be borne in mind. However, tax exemptions for biofuels are often introduced as a means of achieving certain (environmental) objectives, e.g. a reduction in fossil fuel consumption. Thus if unintended adverse impacts on the environment result when the instrument is implemented, this needs to be addressed and the design of the instrument needs to be re-evaluated - as has been the case in Germany.

3.1 Testing the QUICK SCAN MODEL

3.1.1 *Linkage 1 - the impact of the support on the volume and composition of output in the economy*

<p>1. Linkage 1 - the impact of the support on the volume and composition of output in the economy. This identifies the link between the type of subsidy, its point of impact (input, output, profit or income), the price elasticity of demand and supply associated with the activity subsidised and ultimately the impacts on the levels of production and consumption. This in turn is what creates pressure on the environment. The following points are required to describe the linkage.</p>	
<p>1.1. <i>Describe the type of subsidy</i></p>	<p>Fuel tax exemptions are a key form of subsidy aimed at promoting the adoption of biofuels in European markets ie liquid fuel oils produced from biomass either used in transport or by stationary energy sources. In Germany there has been a relatively long history of tax exemptions applied to specific forms of biofuels. The focus of this case study is Germany's 2004 fuel tax exemption for pure and blended biofuels. This can be considered an output linked form of support (conditional on the purchase of a particular input - ie biomass, or the use of a particular production process - ie one that produces biofuels). It is an off-budget support mechanism that grants preferential tax treatment for producers of biofuels relative to producers of competing fuels in the economy (OECD, 2007c).</p> <p>This tax exemption was introduced on the basis of Directive 2003/96/EC on the taxation of energy products and electricity. The 2004 tax exemption amended the Mineral Oil Tax Act (Mineralölsteuergesetz) and extended the tax exemption for pure biofuels (which had been in place since 1993) to blends of biofuels. For the purposes of the tax exemption, biofuels are defined as energy products derived from biomass in the meaning of the German regulation on biomass of 21 June 2001 (European Commission, 2006). The 2004 tax exemption was subsequently amended in 2006 (by the Energy Tax Act) to take account of the overcompensation detected relative to fossil fuels. In 2007 this was replaced by the Biofuel Quota Act which introduced a mandatory quota system that obliges firms marketing fuels to include a minimum percentage (quota) in the form of biofuels. A law on the amendment of the promotion of biofuels adopted in June 2009 reduced the mandatory blending levels for biofuels, reduced the effective increase in tax applied, and freed the target for 2014 to 6.25 per cent. This case study will focus on the impact of the 2004 fuel tax exemption. The subsequent amendments of the legislation will be analysed as possible options for reform (see section on 'policy reform' of Integrated Assessment tool).</p>
<p>1.2. <i>What is the point of impact (conditionality) of the subsidy</i></p>	<p>The tax exemption is an output linked subsidy. It sought to approximate the after tax market prices of biofuels and fossil fuels and thus enable biofuels to enter the fuel market. This competitive pricing indirectly stimulated demand for biofuels and further increased the revenues of the biofuels industry collectively. The scheme was based on expected market prices, in order to comply with EU tax and State Aid rules and to avoid overcompensation, it underwent regular adjustments to take into account real market prices.</p>
<p>1.3. <i>What are the intended recipients of the subsidy</i></p>	<p>The intended recipients of the subsidy are the finished product producer/input consumer. The tax exemption is administered in the form of a rebate made on request by entitled biofuel manufactures, mineral oil manufactures (that blend biofuels) and trading companies operating tax warehouses (UFOP, 2004).</p>
<p>1.4. <i>Size of the subsidy</i></p>	<p>The excise tax exemption for biodiesel led to a reduced tax revenue of approximately €559 million in 2004 (Federal Ministry of Finance, 2005). According to estimates by the Ministry of Finance, the revenue losses would increase to €1.5 billion. Kutas et al (2007) estimate that the loss of fiscal revenues from tax exemptions for ethanol, biodiesel and pure plant oil was €1.21 billion in 2005 and €1.98 billion in 2006. This is relative to what would have been earned if biofuels had been taxed at the full mineral oil tax rate applied to fossil fuels. This substantial burden on the public budget was a key reason for reform of the tax exemption in 2006 (see section on 'policy reform' of integrated assessment).</p>

	<p>In 2004, the following excise duties for mineral oils applied: €470.40 per 1000 l for diesel used as propellant and €654.50 per 1000 l for petrol used as propellant. Under the 2004 scheme, pure biofuels were fully exempt from the mineral oil duty, ie, a full reimbursement of excise duty applies to biodiesel (€470.40 per 1000 l), vegetable oil (€470.40 per 1000 l) and bioethanol (€654.50 per 1000 l). For biofuels blended with fossil fuels, the percentage of blended biofuels derived from biomass sources is fully exempt from the mineral oil duty. The tax rebate is granted on request after the excise duty for mineral oil has been paid (European Commission, 2006).</p>
<p>1.5 Description of the sector</p>	<p>Germany is Europe's and the world's leading producer of biodiesel, and Europe's largest consumer of biodiesel. The Government has supported the biofuels industry since the early 1990s and has played an important role in the development of the industry. The excise tax exemption has been an important trigger in stimulating the domestic market and had a significant impact on the introduction of biodiesel blends in the market after 2004.</p> <p>Biodiesel production (EBB, 2009): 2002 - 450,000 t 2003 - 715,000 t 2004 - 1,035,000 t 2005 - 1,669,000 t 2006 - 2,662,000 t 2007 - 2,890,000 t 2008 - 2,819,000 t</p> <p>Bioethanol production (Kutas et al, 2007): 2004 - approx. 19,723 t (mainly used for the production of ETBE) 2006 - 340,174 t</p> <p>Consumption of biofuels for transport (Euroserv'er, 2008 and 2009): 2004: 1,200,000 l biodiesel and 82,380 l bioethanol (Federal Government, 2005) 2006 - 3,475,225 toe (2,532,003 toe biodiesel and 304,738 toe bioethanol) 2007 - 3,899,434 toe (2,906,266 toe biodiesel and 296,515 toe bioethanol) 2008 estimate - 3,257,186 toe (2,477,983 toe biodiesel and 402,000 toe bioethanol)</p> <p>Market share (share of biofuels in total fuel consumption in relation to energy content): 2003 - 1.4% 2004 - 1.8% 2005 - 3.6% 2006 - 6.3% 2007 - 7.3% (National reports on implementation of Directive 2003/30/EC, 2004, 2005, 2006, 2007, 2008).</p> <p>Between 1993 and 2004, biodiesel was primarily used in pure form (B100) following the exemption for pure biofuels from mineral oil tax introduced in 1993. This changed with the 2004 extension of the tax exemption, which resulted in a significant increase in the share of low blends of biodiesel (B5) on the market. There is a gradually increasing use of pure vegetable oil, mostly in heavy vehicles such as lorries, agricultural tractors and company fleets. This remains a niche market given vehicle conversion costs. The market for bioethanol began to develop in 2004 due to the tax change and gradually increased, mainly focused on low blends (up to 15% ETBE or E5).</p> <p>Feedstock type and cultivation area: Rapeseed oil is the most common feedstock used for production of biodiesel based on climatic conditions and yield. Rye and wheat are the main domestic feedstocks used in the production of bioethanol. The agricultural area used for the cultivation of rapeseed for non-food purposes in 1999 was approximately 369,765 ha and approximately 900,000 ha in 2005-2006</p>

(Pelkmans et al, 2007). Government estimates indicate that in 2007, some 1.75 million ha were used to grow energy crops (Federal Government, 2009). This increase has been supported by increased demand, set aside provisions of the CAP and the energy crop premium which provided a grant of €45 / ha for the cultivation of energy crops on non set-aside land. Since the early 2000s, increasing amounts of feedstocks for non-food use were grown on areas where food may be produced (basic areas) rather than non-food areas (set-aside areas) thus ‘crowding out’ crop cultivation for non-food purposes (Pelkmans et al, 2007).

Competition: There is competition for cultivated biomass in terms of the **cultivation area** available, ie for food versus non-food purposes. There is also competition in terms of the **final usage of the biomass produced** (ie as industrial crops, for heating and cooling purposes, for process oils eg rapeseed which can be used for food purposes); as well as competition for the **end use of the fuel oil produced** (which can either be used for transport fuels or as a fossil oil substitute in other heating systems, or can be exported to other significant and growing markets). Finally, there is competition between the **uses of biodiesel within transport** - biodiesel can either be used in pure form in specific niche vehicles or blended into fossil fuel oils for distribution across the fleet.

Market conditions: There are a number of biofuels producers and suppliers in Germany. The German biofuels industry is very well organised thorough a number of extensive trade associations that are very effective in lobbying policy makers, coordinating research, promoting products, exchanging information and facilitating cooperation between farmers, the biofuels industry, oil companies and automobile manufacturers. The main trade association in Germany is the Union for the Promotion of Oil and Protein Plants (UFOP); others include: the Association of the German Biofuels Industry (VDB), and the German Biofuels Association (LAB). A number of automobile manufacturers in Germany have supported the use of biodiesel by assuring the provision of general or limited warranties for new diesel models. A significant proportion of passenger cars in circulation in Germany are biodiesel-approved, while a number of heavy goods vehicles, buses and utility vehicles are approved for biodiesel use with warranties issued on request. The German Automobile Industry Association (VDA) has also declared its support for low blends of bioethanol such as E5.

Infrastructure: In 1996, the marketing of leaded petrol was banned in Germany by the federal Government. This required more than 1000 pumps at service stations to be replaced and many stations adopted biodiesel as an attractive alternative. This transition in the distribution system helped to transform the biofuels industry in Germany from a niche market to the wider consumer market (IFEU, 2005). In terms of infrastructure for low level blends of biofuels, this is generally undertaken at refineries or other major infrastructural nodes for the distribution of such fuels, thus a dedicated fuel pump infrastructure for transfer to end users is not required.

Quality standards: As a basis for cooperation with car manufacturers, Germany adopted a biodiesel quality standard in 1994, which was subsequently revised and replaced by DIN EN 14214. Poor quality control in early years led to the establishment of an association for quality assurance in biodiesel production and distribution - AGQM (Association for the Quality Management of Biodiesel) in 1999. The AGQM requires even higher quality standards than those defined in DIN EN 14214, and has a certification scheme and quality control procedure that has been a very important factor for further cooperation with vehicle manufacturers.

A quality standard for pure vegetable oil has also been established (DIN V 51605). While there is no standard for bioethanol, for tax purposes, bioethanol is only permitted in high-concentrated, non-denatured form (with a minimum 99% EtOH content) which acts as a de facto standard.

In terms of technical fuel norms, biodiesel blends are to meet the European standard DIN EN 590 (which allows blends of up to 5% without labelling, higher blends may be sold but should be labelled appropriately), while bioethanol blends should meet

	<p>the European standard DIN EN 228 which permits an ethanol proportion of up to 5% by volume. With regards to ethyl tertiary butyl ether (ETBE, a chemical derivative of bioethanol) up to 15% blending by volume is permitted.</p> <p>Trade: The lack of specific tariff lines for fuel ethanol and biodiesel makes it hard to accurately assess trade flows and their impacts on prices. Ethanol is reported under two codes at the HS-6 level: HS 2207 10 for undenatured ethyl alcohol (which makes up the majority of EU imports) and HS 2207 20 for denatured ethyl alcohol and other spirits (under which only a small proportions of imports fall); while biodiesel is included in the wider category of HS 3824 90 of chemical products and preparations. In general in Europe, bioethanol is often imported as a complete product, already blended product (in which case imports fall under heading 3842); while biodiesel raw materials are imported and subsequently processed in Europe. Fuel quality standards and blending restrictions (blends higher than 5% require separate pumps and labelling which in turn need significant capital investment) act as a further form of border protection.</p> <p>In terms of extra-EU trade of biofuel products, EU applies a most favoured nation (MFN) tariff of €10.20/hl on ethyl alcohol and other spirits, denatured, of any strength and €19.20/hl on undenatured ethyl alcohol of an alcoholic strength by volume of 80 % volume or higher. The tariff on biodiesel imports is 6.5% while the tariff applied to pure vegetable oils for the production of biodiesel ranges from 0% for crude palm oil to 3.2% for crude soy oil, rapeseed oil, and sunflower oil (European Commission, 2009).</p> <p>In terms of intra-EU trade, as the German tax exemption applied equally to domestically produced biofuels and imports, it had an impact on biofuels production across Europe. In 2005, more than 50% of domestic production relied on imported feedstock and about 300,000 - 400,000 tonnes of biodiesel was imported into Germany, with most of these imports coming from neighbouring countries (UFOP, 2006).</p>
<p>1.6 Price elasticity of demand and supply of the input and output markets.</p>	<p>Demand for fuel is inelastic given that it is considered a necessity good. A short term (1 year) elasticity estimate for vehicle fuel consumption is -0.25, while in the long term (5 years) elasticity is estimated to be -0.64 (using time series data from a number of countries - Goodwin et al, 2004).</p> <p>In terms of estimating elasticity of demand and supply for biofuels, due to a lack of available data, estimates are based on calculations of supply and demand elasticities in the US ethanol market (Luchansky and Monks, 2009) which produced the following results:</p> <ul style="list-style-type: none"> • In terms of supply, price elasticity is estimated to be between 0.22 and 0.26. Thus ethanol production is very price inelastic at least in the short term. • In terms of demand, price elasticity is estimated to be between -1.61 and -2.92. Thus ethanol demand is very price elastic. <p>It should be noted that the US bioethanol market is very different from the European one with significant price protection aimed at supporting the corn industry. In addition the US has a higher dependency on petrol rather than diesel and petrol in combination compared to Europe. This will inevitably affect the estimates of elasticity presented above. However, a general conclusion that can be drawn from these results is that demand for biofuels is relatively elastic given its substitutability with fossil fuels. Consumers are influenced by price considerations and availability (more so than environmental concerns) and the final consumption of biofuels is heavily dependent on the corresponding price of fossil fuels. Thus, if the price of biofuels was to increase significantly, it is likely that consumers will switch to other relatively cheaper (fossil) fuels. In the supply market, production is less sensitive to price changes, at least in the short term, given capacity limitations.</p>

3.1.2 Linkage 2 – The mitigating effect of environmental policies in place

<p>2. Linkage 2 – The mitigating effect of environmental policies in place – which takes into consideration policies and emission abatement techniques. Linkage 2 measures the emissions or environmental impacts that result from a volume of activity excluding those ‘filtered’ by environmental policies. Note: Because of the complexity and data requirement difficulties associated with establishing linkages 2 and 3 here just draw qualitative conclusions or quantitative only where possible.</p>	
<p>2.1. Are there any environmental policies in place or emission abatement techniques which mitigate the impacts of the support?</p>	<p>The cultivation of feedstocks in Germany is subject to rules for good professional practice (<i>Gute fachliche Praxis</i>) and cross-compliance regulations. Farmers are required to comply with environmental protection requirements and meet minimum levels of environmental standards as a condition for benefiting from market support.</p> <p>A number of different types of environment related policies that aim to control air, water and waste emissions and sets requirements for sustainable land use also exist. These include <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Water Protection Law (Gewässerschutzrecht, WHG): Sets principles concerning the use of water, in particular demands on the discharge of waste water and the protection of groundwater, providing a general framework which relevant Land laws implement. • Soil Protection Act (Bodenschutz- und Altlastenrecht, BBodSchG): Formulates ‘good professional practice’ for sustainable land use. • Federal Nature Protection Act (Naturschutzrecht, BNatSchG): Sets principles for nature conservation including minimum shares and general requirements for protected areas and habitat networks and determines compensation measures for projects impacting on ecosystems. In terms of conventional agriculture, requirements do not go beyond good professional practice. • Closed Substance Cycle Waste Management Act (Abfallrecht, KrW-/AbfG): Regulates the handling of and disposal of waste. Implemented by different administrative regulations. The waste laws of the different Land have additional regulations, and there are a number of other executive order laws and administrative regulations in this area. • Fertilisers Act (DüngMG): Licenses the types of fertilizer, labelling and packaging, the principles of good professional practice during the application of fertilizers. • Fertilisers Ordinance (DüV): Specifies good professional practice for the use of fertilisers, soil conditioners, growing media and plant strengtheners on land used for agriculture and for the mitigation of risk from the use of such substances. • Crop Protection Act (Pflanzenschutzgesetz, PflSchG): Specifies good professional practice concerning the use of pesticides. • Federal Emission Control Act (Immissionsschutzrecht, BImSchG): The Act aims to prevent the harmful effects on the environment of air pollution, noise, vibration and similar phenomena. More than 30 Federal Emission Control Acts implement the legislation in practice, including technical details, standards for specific types of plants, details of licensing procedures, systems control and emission limits for VOC from decanting and storing fuels. <p>In addition to the above mentioned Acts, various levies are applied at the level of the <i>Land</i> that aim to control emissions through economic incentives, these include:</p> <ul style="list-style-type: none"> • A levy on the extraction of water (called <i>Wasserpfeennig</i>) from surface water and groundwater bodies. The amount charged is generally graduated according to how and why the water is removed. • The Wastewater Charges Act (<i>Abwasserabgabengesetz</i>) is a federal framework act supplemented by implementation acts of the <i>Länder</i>. The <i>Länder</i> collect levies on discharges of wastewater into water bodies by local authorities, large industrial facilities, small-scale dischargers and domestic wastewater treatment installations. • Local authorities also collect wastewater management fees within the

	<p>framework of the relevant <i>Länder</i> laws on municipal fees and levies, to cover costs of operating and maintaining wastewater treatment facilities.</p> <ul style="list-style-type: none"> • Other environmental levies (<i>Umweltabgaben</i>) include payments introduced by the <i>Länder</i> as a special form of compensation measures pursuant to the Federal Nature Conservation Law (<i>BNatSchG</i>) and are collected as natural compensation (i.e. compensation for damages to natural assets) that the Act primarily requires. <p>In addition to the technical quality standards, biofuels are also affected by EU exhaust fuel standards, which apply to diesel vehicles from 2005 (EURO IV) and from 2008 (EURO V) and for utility vehicles since 2005/2006 (EURO IV). In order to comply with these requirements, technical adjustments particularly for biodiesel and vegetable oil as pure fuels are necessary (FNR, 2006).</p>
2.2 What are the impacts of the environmental policies in place?	<p>As stated previously, it is important to note that tax exemptions are not a stand-alone subsidy, and interactions with other instruments, as well as wider biofuels policy objectives and agreed targets should be taken into account. With this in mind, while the environmental policies in place to some extent act to reduce / control emissions from the cultivation and production of biofuels; the existing measures do not guarantee the elimination of all negative environmental impacts associated with the increased production of biofuels. Even if biofuel crops are cultivated in accordance with the current rules for good professional practice and EU cross-compliance requirements, the further intensification of land-use, the expansion of large-scale farms with monocultures of biofuel crops, and the displacement of food crop cultivation to previously undisturbed areas will still have potentially significant harmful environmental impacts. Whereas regulations controlling emissions from stationary processing plants are not always implemented effectively, nor are they considered sufficient to avoid the worst environmental impacts of biofuels production.</p> <p>A 2007 report by the German Advisory Council on the Environment (SRU, 2007) maintains that as the production of renewable raw materials leads to increased production pressure on land already used for intensive farming and to an increased tendency towards intensive farming of land that is only farmed extensively or not at all, there is a need for rigorous enforcement of standards of good professional practice. The report also notes a number of loopholes in existing legislation relating to the use of fertilisers (in particular the continuing high levels of nitrogen excesses); use of pesticides (the use of which is expected to increase as a consequence of large scale monocultures); minimum crop rotation requirements; grassland and wetland conversion (as neither cross-compliance rules nor rules on good professional practice offer adequate protection against ploughing of pasture); the protection of fringe elements and structural elements as laid down in the Federal Nature Conservation Act (BNatSchG) and in the cross-compliance rules; and the growing of renewable raw materials (such as genetically modified plants) on land subject to statutory protection.</p>

3.1.3 Linkage 3 – the assimilative capacity of the environment

<p>3. Linkage 3 - the assimilative capacity of the affected environment – which represents the dose response relationship taking into account the assimilative capacity of the environment. This might be a highly site specific factor, particularly when the emissions have predominantly local or regional effects, therefore evaluated through dedicated studies. However, in the case of pollutants that have global effects (like CO₂ emissions or CFCs) effects are not site specific and general conclusions can be drawn.</p>	
3.1. First, could you describe what the size of the environment	<p>Caveat Before looking at environmental impacts; it is important to reiterate that tax exemptions are one instrument used in pursuit of biofuels policy objectives. In this context, it is difficult to extrapolate the specific environmental, social and economic impacts of the tax exemption from the impacts of other instruments that also seek to</p>

<p>tal damage is? Where possible could you quantify? Otherwise, describe qualitatively</p>	<p>meet biofuels policy objectives per se. Tax exemptions are not a stand-alone subsidy, and interactions with other instruments, as well as wider biofuels policy objectives and agreed targets need to be borne in mind when interpreting the below results.</p> <p>Counterfactual Biofuels bring environmental benefits as substitutes to fossil fuels provided energy crops are produced in a sustainable way. The environmental benefits of biofuels mainly rest in the GHG emissions saved from their use relative to the counterfactual, ie what would have happened if biofuels were not used (increased fossil fuel consumption).</p> <p>There was a significant increase in the cultivation of rapeseed oil crops in Germany following the 2004 tax exemption. The share of crops accounted for by renewable raw materials shows a more than fivefold increase since the early the 1990s and in 2007 stood at 13% of arable land (FNR 2006 cited in SRU, 2007). Government estimates indicate that in 2007, some 1.75 million ha were used to grow energy crops (Federal Government, 2009). The environmental impact of this increased cultivation can be assessed against the counterfactual, ie what would have happened if the extra crops had not been grown. In terms of energy use, not using biofuels would lead to more fossil fuels being burned for transport or stationary plants, resulting in more GHG emissions and adverse environmental impacts associated with exploitation of oil resources that the use of biofuels would avoid. The environmental impact of cultivation in terms of land use mainly refers to further intensification of agriculture, additional pressure on extensively used farmland, narrowing crop rotation, grassland conversion, N₂O emissions from fertiliser used. Until 2009, farmers were allowed to grow energy crops on compulsory set aside land, thus at the time of the tax exemption most rapeseed-oil crops were cultivated on set-aside land. If the cultivation of rapeseed had not increased, more set-aside would probably have been left uncultivated, which would have had a better impact in terms of agri-environment and biodiversity. Moreover, crops grown for biofuels occupy land which could be used for biomass for other bioenergy applications which save far more GHG emissions than biofuels, eg corn used for biogas in combined heat and power systems generates more than three times more energy per hectare than biodiesel from rapeseed (SRU, 2007). In summary, the increased production and consumption of biofuels resulted in a domestic reduction of GHG emissions and some negative impacts in terms of land use due to further intensification of agriculture and the cultivation on set-aside land that would otherwise not have been cultivated.</p> <p>Environmental impacts A comprehensive assessment of the overall environmental impact of biofuels is particularly difficult and complex to achieve and is currently the subject of significant scientific debate. The environmental performance of biofuels differs greatly in terms of life-cycle energy and GHG emission balances, which vary according to the different methodologies used and assumptions concerning the use of by-products. Performance also differs between fuels and even for a single fuel and feedstock, and varies according to production processes and farming practices. There is also a wide range of uncertainty in the estimation of emissions of CO₂ from soil and emissions of N₂O from the cultivation of feedstocks, which vary according to soil type and farming technique and can account for a large part of the overall GHG emissions for some conventional biofuels. This uncertainty and complexity should be kept in mind when interpreting the below results.</p> <p>GHG savings: The lifecycle GHG emissions of biofuels depends on the type of feedstock used, how it is produced and processed and subsequently distributed. According to German Government estimates, in 2004 each litre of biodiesel consumed resulted in a saving of approximately 2.2 kg of CO₂ relative to fossil fuels – based on production of rapeseed ‘with average production conditions in Germany and with a typical use of the complementary products’. Given total consumption of biodiesel in 2004 of 1.05 Mio t, this equates to a saving of 26 Mio t of CO₂ in 2004. Regarding bioethanol, each litre of bioethanol consumed is</p>
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estimated to have resulted in an average CO₂ saving of 1.15 kg in comparison to fossil fuels, with a total saving of 94,000 t (Federal Finance Ministry, 2005).

More recent research indicates less favourable GHG emission savings for conventional biofuels. The JEC well-to-wheel report (as cited in De Santi et al, 2008) estimate the direct GHG savings from EU production of biodiesel to be between 40-43% and of bioethanol to be between -10 to 70%. An analysis by a Scientific Advisory Board on Agricultural Policy in 2007 found that the production of biodiesel and bioethanol in Germany achieves very low CO₂eq mitigation level of less than 3 t CO₂eq per hectare, while more than 12 t CO₂eq/ha can be achieved with other bioenergy routes (eg wood chip CHP based on short rotation plantations) (Isermeyer et al, 2007).

Another factor that contributes to the GHG balance of biofuels is the level of nitrous oxide (N₂O) emissions released from farm soils. A Scientific Advisory Board on Agricultural Policy concluded that with globally limited arable land, a large scale expansion of bioenergy will lead to the cultivation of previously uncultivated areas (ploughing up of grassland, forest clearing) which would increase CO₂ and N₂O emissions, meaning that the expansion of bioenergy production on arable land might even be counterproductive for climate protection. It is not possible to control these risks with the certification systems planned by policy makers (Isermeyer et al, 2007). There is significant uncertainty concerning estimates of emissions, with a JRC model showing a variation of more than 100 from one EU wheat field to another depending on the organic content of the soil (De Santi et al, 2008). An unpublished report for the German Environment Agency found that when N₂O emissions are included, biodiesel produced from rapeseed in Germany is associated with three times the GHG emissions of conventional diesel (as cited in OECD, 2007b). In a 2009 report by the German Advisory Council on Global Change (WBGU) adjusted GHG saving potentials of different bioenergy technology pathways by including emissions (CO₂, CH₄ and N₂O) on direct and indirect land use change (LUC) in the Life Cycle Assessments (LCA). Figures show that biodiesel produced from rape has a saving potential below 30% compared to the fossil equivalent when only direct land use change is factored in. GHG savings are even negative (approx. minus 30%) if indirect land use changes occur when rape is grown for biodiesel. Figures for ethanol show similar patterns with ethanol from grain and corn accounting for around 30% GHG savings with direct land use change included and a minus of approx. 45% and 10 % GHG saving, respectively with indirect land use change included. A negative GHG saving potential means in this context that more emissions are released than if fossil fuels are used (WBGU, 2009).

Energy savings: In 2004, German Government estimates show that the total consumption of biodiesel as opposed to diesel fuel resulted in an energy saving of 56PJ (IFEU, 2005). The energetic relation of input/output of biodiesel is estimated to be 1:3.5 and for bioethanol it is estimated to lie between 1:14 to 1:31 depending on the raw material used and the utilisation of the by-product (Federal Finance Ministry, 2005). The JRC well-to-wheel analysis indicates a fossil energy saving for biodiesel between 55-58% and between 10 and 90% for bioethanol (JRC, 2007).

Other environmental impacts: The final report of the IFEU study on 'Biodiesel initiatives in Germany' (IFEU, 2005) notes that the total consumption of biodiesel in 2004 as opposed to diesel fuel resulted in:

- 10,300 t SO₂ equivalent of more acidifying gases emitted,
- 2,400 t PO₄ equivalents of more nutrifying gases emitted,
- 2,200 t more N₂O emitted which contributes to stratospheric ozone depletion.

In terms of the environmental impacts of the **usage** of biofuels:

- Biodiesel causes 50% less SO₂ and diesel particle emissions than fossil diesel.
- Pure **PPO** and **RME** can halve emissions compared to fossil diesel. This positive effect decreases if the general implementation of diesel particulate

	<p>filters become standard.</p> <ul style="list-style-type: none"> Aldehyde emissions from the combustion of ethanol blends are slightly higher than from the use of pure petrol. Aldehydes might be carcinogenic and are constantly emitted by vehicles without catalytic converters (Wuppertal, 2005). <p>Impacts on land and biodiversity: The environmental impact of growing rape in Europe is seen to have a medium to high risk of nutrient leaching, high risk of pesticide inputs, a medium risk of erosion, low risk of soil compaction, medium to high impact on biodiversity and a low to medium impact on agro-diversity. The environmental impact of growing sugar beet in Europe is seen to have a medium to high risk of nutrient leaching, a medium risk of pesticide inputs, a high risk of erosion and soil compaction, low to high risk of water consumption and a medium impact on biodiversity and agro-diversity (SRU, 2007). Furthermore, a significant driver behind the rapid conversion of grassland has been the cultivation of biomass for use as fuel (SRU, 2008).</p> <p>Indirect impacts: In addition to the direct environmental impacts mentioned above, diverting domestic production from food or animal feed markets for non-food purposes, will result in increased imports of food and feedstocks (assuming people do not change their eating habits). This will in turn increase agricultural production in food and feed producing third countries. This could result in higher indirect annual emissions from fuel and fertilizer use and nitrous oxide release that arise from additional production. Furthermore, indirect land use change may lead to additional GHG emissions if the area of arable land is increased and the carbon stored in undisturbed soils and forests is released. The overall size of these impacts are not yet known, but many cases of deforestation, land degradation and water depletion continue to be reported from all over the world, with the increasing demand for biofuels feedstocks being cited as one of the reasons for these changing land use patterns. The impacts of indirect land use change are expected to be significant and the indirect GHG emissions are likely to be much higher than direct emissions (De Santi et al, 2008).</p>
<p>3.2. Could you provide insights on the assimilative capacity of the environment to these impacts?</p>	<p>N/A</p>

Summary of the results of the application of the quick scan to the case study

<p>1. Is the support likely to have a negative impact on the environment?</p>	<p>As stated previously, it is important to note that tax exemptions are not a stand-alone subsidy, and interactions with other instruments, as well as wider biofuels policy objectives and agreed targets should be borne in mind. In this context it is difficult to extrapolate the environmental impact of the 2004 tax exemption from the impacts of other biofuels support measures in place. However, general conclusions can be drawn regarding the impact of the increased production and consumption of biofuels in Germany since 2004.</p> <p>The increased use of biofuels in Germany resulted in a reduction of GHG emissions due to the substitution of biofuels for fossil fuels for use in transport and stationary plants. It also resulted in an increase in cultivation and processing of rapeseed oil crops in Germany with some negative impacts in terms of land use, in particular to the extent that biofuels crops were grown on previously uncultivated land (ie set aside land). The net environmental impact is uncertain and varies according to different methodologies used / assumptions made. The assessment is further complicated by the need to include indirect land use changes due to the displacement of food crop cultivation to previously undisturbed areas as existing areas are used for the cultivation of energy crops both domestically and in third countries.</p>
<p>2. Does the support succeed in transferring income to the intended recipient?</p>	<p>Yes - the tax exemption directly benefits the biofuels producer / blender by approximating the after tax prices of biofuels and fossil fuels and thus enabling biofuels to enter the fuel market.</p>
<p>3. Is the support worthy of further scrutiny to assess whether their reform/removal would benefit the environment?</p>	<p>Yes</p>
<p>4. What are the impacts on the subsidy on trade? Are they important? How likely it is that if you remove a subsidy in country X, it will have any global environmental impacts?</p>	<p>The tax exemption for pure and blended biofuels also applies to imports, provided that the relevant authority in the country of manufacture is able to issue a certificate establishing the nature of the biomass used in the imported biofuel. Import tariffs on certain categories of biofuels protect domestic producers from competition and have an adverse effect on more efficient producers in developing countries, eg ethanol from Brazil. Trade disputes between the US and the EU soared in 2009 when generously subsidised biodiesel from the US flooded the European market. European producers complained that producers in the US benefit twice: from subsidies by their federal government and again from subsidies granted by individual governments (including tax exemptions) when biodiesel is sold in Europe. As a result the EU imposed duties on US biofuel in 2009. The duties, which came into force on 12 July 2009, range from €23 to €41 per 100 kg and will last for up to five years. The removal of the tax exemption will serve to increase the price of domestically produced biofuels and may encourage further imports from more cost-efficient producer countries (depending on the level of tariff protection, corresponding fossil fuel prices etc).</p> <p>The tax exemption also has an indirect impact on imports of oilseeds for food purposes. The increased demand for feedstocks for biofuels production diverts EU rapeseed oil from the food market. This in turn results in a subsequent increase in imports of oilseeds and oils, such as cheaper palm oil to meet the demand in food and other commodity markets. Increased demand for imports of feedstocks for either food or non-food purposes increases annual indirect emissions from fuel and fertiliser use, while indirect land use change could lead to significant GHG emissions if land in third countries is cleared / soils disturbed, such as peat land and rain forests, for cultivation purposes.</p>

Some additional questions on the use of the quick scan

The OECD 2005 (p.35) criticises the quick scan method, as not so easy to apply method. In particular, the linkages portrayed by quick scan model can be assessed only through the use of general equilibrium models. The technical and resource constraints of policy makers makes it not always possible to use such models and is 'generally necessary to adopt a more pragmatic and simplified approach.

Based on the application of the tool to your case study, do you think it possible to use the quick scan and produce credible results without employing a general equilibrium model and environmental impact evaluation techniques?

The quick scan model provides a general overview of the main impacts of the subsidy and is a useful tool for gathering qualitative data of the subsidy and the subsidised sector. However the complexities of the case need to be borne in mind – particularly with regard to the different levels of support related to biofuels, linkages with commodity markets, trade impacts etc and the fact that drawing concrete conclusions on Linkage 2 and 3 can be particularly difficult given data constraints and causality issues.

3.2 Testing the checklist

3.2.1 Step 1 – Does the policy filter effectively limit environmental damage?

<p>Is there an environmental policy filter (e.g. size of tradable quota after subsidy removal; level of standards; production limits; rates of environmental taxation; demand and supply elasticities of taxed item etc) which mitigates the effects of a subsidy in the environment? If effective, the removal of the subsidies will bring no or little benefit. Note this section could usefully build on the information collected for analysing linkage 2 in the quick scan.</p>	
1. Describe the environmental policy filter	See section 2.1 of the Quick Scan.
2. What restrictions to production, pollution or resource depletion levels result from the policy filter?	Various environment related policies and levies in place at the Federal and Land level seek to reduce / control emissions to soil, air and water, limit water resource depletion, manage waste, and reduce encroachments on nature that arise from the cultivation and production of biofuels. However, the tax exemption provided for biofuels is not linked to any environmental criteria thus there is no real incentive to produce biofuels that reduce GHG emissions or are environmentally beneficial. To qualify for the tax exemption, producers merely need to prove the <i>nature</i> of the biomass in question. With regards to pure biodiesel, producer records concerning the quantities manufactured from plant-based raw materials are considered sufficient proof. Regarding blends, producers need to provide proof of both the nature of the biomass in the biofuel added to the mixture and how much has been added.
3. What will happen to the policy filter once the subsidies are removed?	The policy filters in place are not directly linked to the tax exemption; rather they aim to regulate national agricultural and industrial activity in general. Thus the removal of the tax exemption will not have a significant influence on the policy filters. Furthermore, in certain cases the filters are implementing EU legislation and are required to meet various environment related commitments of the Government.
In the light of the above answers, is the policy filter effective in mitigating the environmental impacts caused by the subsidy?	<p>The policy filter is only partially effective in limiting the environmental damage caused by the subsidy. While it provides some restrictions on the cultivation and production process that act to control the environmental impact of increased biofuels production to some extent; it is not able to fully mitigate the additional environmental impacts associated with biofuels production. Furthermore, the fact that the tax exemption does not distinguish between biofuels depending on the type of feedstock used or production methods employed or the GHG emission savings achieved, means that the tax exemption may support biofuels that are in fact more expensive and have a greater impact on the environment than certain types of fossil fuels.</p> <p>A 2007 report by the German Advisory Council on the Environment (SRU, 2007) notes a number of loopholes in existing legislation relating to the use of fertilisers (in particular the continuing high levels of nitrogen excesses); use of pesticides (the use of which is expected to increase as a consequence of large scale monocultures); minimum crop rotation requirements; grassland and wetland conversion (as neither cross-compliance rules nor rules on good professional practice offer adequate protection against ploughing of pasture); the protection of fringe elements and structural elements as laid down in the Federal Nature Conservation Act (BNatSchG) and in the cross-compliance rules; and the growing of renewable raw materials (such as genetically modified plants) on land subject to statutory protection.</p>

3.2.2 Step 2 - More benign alternatives are available now or emerging

<p>Availability of more benign technological alternatives (present or emerging) - comparison of the environmental profile of the subsidised product and probable ones) and how the environmental profile of these and modes of production compare to the previously subsidised ones. It should be noted that, at least for the long term availability, this might require some judgement from the analyst (Pieters, 2003). A categorisation of the main technological strategies of environmental policy is included in table included in table 4 in the Annexes.</p>	
<p>1. Are there technologies and products likely to replace the previously subsidised products and modes of production?</p> <ul style="list-style-type: none"> Please note: consider not only domestic technologies/products but also products/technologies available abroad. 	<p>In 2004, the Federal Government presented a fuel strategy for Germany which highlights a number of alternative fuels for vehicles with the highest impact on fossil fuel substitution in the medium and long term (beyond 2020), these include:</p> <ul style="list-style-type: none"> • increased efficiency in petrol and diesel engines, • synthetic fuels from solid biomass (BTL), • combined drive systems (hybrids), and • hydrogen fuel technologies (engines and fuel cells). <p>In the strategy, BTL are said to offer the greatest potential given the extensive raw material base (all types of biomass, eg waste, plants, wood etc). A number of related projects and measures relevant to BTL fuels including selection, cultivation, harvest, supply and logistics of energy crops are being supported in Germany by well know plant engineering, energy and car industries. This support focuses on the implementation of different BTL production processes and the environmental and economic assessment of BTL processes (Federal Government, 2004).</p> <p>Other second generation biofuels being considered in Germany include biogas and blended second generation biofuels.</p> <p>In addition to this, the wider alternative of cars fuelled by totally different systems, i.e. electric or fuel cell vehicles is another area being explored. Ultimately many are hoping that these technologies would at least replace internal combustion engines in a large proportion of private vehicles.</p>
<p>2. How do the environmental profiles of these competing products and modes of production compare with those of the previously subsidised ones?</p>	<p>While second generation biofuels emit less GHG emissions relative to first generation biofuels, they are not necessarily neutral in their environmental impacts and their overall performance (as with first generation) depends on the type of raw materials used, production process employed and distribution mechanisms.</p>

<p>3. Is the implementation of these alternatives hampered by the subsidy under scrutiny?</p>	<p>To some extent implementation of these alternatives is hampered given that the tax exemption does not necessarily encourage firms to invest in alternative technologies which may be more effective, but rather encourages the biofuels industry to continue acting as an ‘eternal’ infant industry (Kutas et al, 2007). However, the tax exemption also applies to second generation biofuels and thus cannot be considered a barrier to the take-up of this technology (which is dependent on other factors - see below).</p>
<p>4. What is the likelihood of these technologies and products to replace the previously subsidised ones?</p>	<p>BTL fuels have a wide raw material base, high yield potential, are similar to conventional fossil fuels in many of their parameters, which means they can be used in highly-developed combustion engines with relatively minor modifications, and they can be distributed through the existing network of filling stations. Estimates predict that the equivalent of 4,000 l of BTL fuel can be produced on 1 ha. If 4 million ha can be made available in the long term in Germany for the cultivation of energy crops, approximately 25% of fuel consumption could be replaced with BTL fuels. However a number of issues related to the technology still need to be resolved, for example efficiency concepts still need to be developed, plants need to be built on an industrial scale and there are remaining questions about logistics , integration and costs, which imply they are not really an option in the short term (FNR, 2006). Furthermore, competition from alternative applications of biomass (CHP, electricity and the needs of existing wood industries) also need to be taken into consideration.</p> <p>It is unlikely that second generation biofuels will be cost competitive with first generation biofuels by 2020. Furthermore, second generation biofuels are likely to rely heavily on imported biomass – given competing demands for wood from both the renewable electricity/heat sector and existing wood industries, it is expected that by the time second generation biofuels are commercially available, it will be cheaper to import wood than compete for a share of the domestic market (De Santi et al, 2008).</p>
<p>In the light of the above, are there more benign alternatives available now or emerging (YES/NO)?</p>	<p>Yes - the shortcomings of first generation biofuels are increasingly recognised and attention is now focused on the development of second generational technologies and wider alternatives such as electric or fuel cell vehicles. The 2007 Biofuel Quota Act provides a tax incentive for second generation biofuels, fuel gas and E85 up to 2015 to encourage their market take up (see section on ‘policy reform’ of the Integrated Assessment).</p>

3.2.3 Step 3 - Does subsidy conditionality lead to higher production?

<p>Some items under step 3 require the use of general equilibrium models. However the use of such models is beyond the purpose of the checklist. The aim of this point should be to detect whether more detailed analysis is required to understand the wider consequences of subsidy removal - note that this step can usefully build on information gathered for <u>Linkage 1 in the quick scan</u>:</p>	
<p>Does the subsidy conditionality (i.e. the point of impact of the subsidy – output, input, income or profit, see <u>Linkage 1</u> of the OECD quick scan) lead to higher production? In order to understand this, the following characteristics of the subsidy need to be understood:</p>	
<ul style="list-style-type: none"> ○ the size of subsidy: 	<p>The excise tax exemption for biodiesel led to a reduced tax revenue of approximately €559 million in 2004 (Federal Ministry of Finance, 2005). Kutas et al (2007) estimate that the loss of fiscal revenues from tax exemptions for ethanol, biodiesel and pure plant oil was €1.21 billion in 2005 and €1.98 billion in 2006</p>
<ul style="list-style-type: none"> ○ elasticities of supply and demand: 	<p>See point 1.6 of the quick scan.</p>
<ul style="list-style-type: none"> ○ duration of subsidy (e.g. when were they introduced and do they have a sunset clause?): 	<p>The full exemption for pure and blended biofuels was introduced on 1/1/2004 and was valid until 31/12/2009. This was subject to an assessment by the Federal Government on the market introduction of biofuels and any overcompensation afforded by the tax exemption. The assessment was to also consider the effects of the exemption on climate and environmental protection, conservation of natural resources, external costs of various fuels, and progress in achieving EU targets. The first report was submitted to the Bundestag on 17 June 2005 (Federal Finance Ministry, 2005).</p>
<ul style="list-style-type: none"> ○ conditionality (e.g. output, income, profits or income? On the importance of conditionalities see OECD, 2005 in Pieters pp.79-85): 	<p>The main point of impact is within the firm and output linked - leading to revenue increases proportional to the volume of production (output).</p>

Continues on next page

<ul style="list-style-type: none"> ○ the distribution of market power (please identify the degree of concentration of factor and goods markets e.g. monopoly, free market): 	<p>There are a number of biofuels producers and suppliers in Germany and market power is relatively dispersed. The German biofuels industry is very well organised thorough a number of extensive trade associations that are very effective in lobbying policy makers, coordinating research, promoting products, exchanging information and facilitating cooperation between farmers, the biofuels industry, oil companies and automobile manufacturers.</p> <p>In 2008, the main players in the German market were ADM Biodiesel which had three production units in Germany with a total production capacity of 1 million tons. The Swiss group Biopetrol Industries AG produced biodiesel at two German sites with a total production capacity of 350,000 tons. The German industrialist Verbio AG has two biodiesel production units and two bioethanol production sites, with the capacity to produce 398,802 tons of biodiesel (349,557 tons in 2007) and 138,478 tons of bioethanol (123,751 tons in 2007). Cargill has 2 biodiesel production plants with capacity of 370 000 tons. Gate has two production plants with capacity of 260 000 and Natural Energy West has one production plant with capacity of 250 000 (Eurobserv'er, 2009).</p>
<p>In the light of the above points, does the conditionality of the subsidy lead to higher production volumes and therefore rates of exploitation of natural resources? Note that this is considered to be analytically the most difficult task (Pieters, 2003),¹ hence some qualitative considerations will be acceptable here if more detailed data are not immediately available.</p>	<p>Tax exemptions are an output linked subsidy and by lowering market prices, the 2004 extension of the exemption to blended biofuels resulted in a significant increase in the domestic production of biofuels and thus a higher rate of exploitation of natural resources. Biodiesel production increased from 715,000 t in 2003 to 2,890,000 t in 2007 (EBB, 2009). However, it is important to keep in mind that a number of support measures are provided to biofuels (ie support for farmers through the CAP, R&D spending, capital grants etc) and the fuel tax exemption is one, albeit important factor, that stimulated the domestic biofuels market since 2004. The importance of the tax exemption became evident when the government gradually introduced taxes on biofuels in 2006 which saw significant drops in production (in 'policy reform' of the Integrated Assessment).</p>

¹ For more hints from the author on the reasoning behind this step, see sections 1.5 and 2 in Chapter 2 OECD 2005. Note: It is difficult to assess lock-in effects quantitatively, since it would require comparing a “with-situation” to a counterfactual “without-situation” (what technologies would have gained market access in absence of the subsidy?). But subsidies that are maintained over a long period are much more likely to have strong lock-in effects, especially when they also directly influence the choice of materials and energy. Taken from OECD 2005 p. 77.

Summary of the results of the application of the checklist to the case study

<p>1. Is the subsidy removal likely to have significant environmental benefits?</p>	<p>As stated previously, it is important to note that tax exemptions are not a stand-alone subsidy, and interactions with other instruments, as well as wider biofuels policy objectives and agreed targets should be borne in mind. In this context it is difficult to extrapolate the environmental benefit of removing the 2004 tax exemption from the impacts of other biofuels support measures in place.</p> <p>A general conclusion that can be drawn is that the removal of the tax exemption will increase the price of biofuels, thus making biofuels less attractive compared to conventional fossil fuels. Coupled with falling fuel prices (which reduce the price differential) and high feedstock prices, this will reduce the incentive for domestic production of biofuels and therefore reduce impacts on the environment from the cultivation and processing of biofuels.</p> <p>The removal of the tax exemption will however also lead to an increase in GHG emissions to the extent that the reduced consumption of biofuels results in an increase in consumption of fossil fuels (given the substitutability of biofuels and other fuels). Thus the overall environmental impact of the removal of the tax exemption is uncertain.</p>
<p>2. Is the exclusion criteria system – i.e. YES/NO approach - a valid approach?</p>	<p>The YES/NO approach is possibly too simplistic given that the answers to certain questions may be more complicated and conclusions not that clear cut (e.g. the policy filter may be partially effective in mitigating environmental impacts).</p>
<p>3. Is the support worthy of further scrutiny to assess whether their reform/removal would benefit the environment?</p>	<p>Yes</p>
<p>4. What are the impacts of the subsidy on trade (what are they, are they important?).</p>	<p>By increasing the costs of production, the removal of the subsidy may decrease domestic production and thus reduce the impact on the environment associated with domestic biofuels production. However, depending on the corresponding price of fossil fuels (which will determine the domestic demand for biofuels) and the level of import protection, this may in turn encourage an increase in imports from more cost efficient locations (eg ethanol from Brazil), which depending on the feedstock used, cultivation methods, production processes etc may have an impact on the environment of third countries.</p>

Some additional questions on the use of the checklist	
Based on the application of the tool to your case study, do you think it possible to use the checklist and produce credible results without employing a general equilibrium model?	The check list provides an overview of available alternatives and provides some insights into the feasibility / prospects for reform. However, it is based on a closed economy, and application to the case of biofuels indicates the importance of taking trade impacts into consideration for a more comprehensive assessment of the overall environmental impact of subsidy removal. Furthermore, in order to determine the net environmental impact of subsidy removal (ie the benefits from reduced production and consumption compared to any environmental impacts of increased consumption of fossil fuels) a more detailed analysis is required (general equilibrium).

3.3 Testing the INTEGRATED ASSESSMENT FRAMEWORK

3.3.1 Features Scan

The <i>features scan</i> asks in part what the impacts of a subsidy are or could be expected to be in relation to its stated objectives.	
1.1. Subsidy objectives:	
<ul style="list-style-type: none"> • <i>What are the objectives of the subsidy, with respect to its environmental, economic and social impacts?</i> Suggestion: the official objectives may be surmised from the legislative history or statements by officials. The objectives may be expressed in terms of environmental economic or social outcomes or some combination of the three. 	<p>The environmental objectives of the tax exemption were to: promote the production and use of renewable fuels, thus reducing GHG emissions; and reduce dependency on oil imports, thus increasing security of supply (European Commission, 2006)</p> <p>In terms of economic objectives, the tax exemption sought to compensate biofuels producers for the higher production costs of biofuels compared to conventional fossil fuels (Federal Finance Ministry, 2005). This would in turn enable biofuels to enter the fuel market at a competitive price thus achieving the underlying environmental objectives of promoting the use of renewable fuels.</p> <p>While the support does not have a strong social rationale in Germany, at the EU level motivations for rural development and new opportunities for agricultural production were part of the objectives of EU biofuels policy. Furthermore, by increasing demand for biofuels feedstocks the tax exemption indirectly acts to support farmers income.</p>
1.2. Subsidy design:	
<ul style="list-style-type: none"> • <i>Does the policy design avoid problems inherent in long-term existence of subsidies?</i> For example, does it have a sunset clause or an adaptive review process (i.e. does it have an in built review process and are subsidies tied to outcomes not technologies) 	Yes - the tax exemption was valid for a limited period (from 1/01/2004 until 31/12/2009) and was subject to an annual review of any overcompensation by a report by the Federal Government to the Bundestag.
<ul style="list-style-type: none"> • <i>Are the conditionalities right?</i> To answer this question, do consider if subsidies are applied to inputs or are conditional to the use of specific technologies, or if they target outputs 	The tax exemption is output linked and enabled biofuels producers to place competitively priced biofuel on the market.

<p>(see note below) etc, also building on the analysis made for Step 3 in the checklist or Linkage 1 of the quick scan. For more on the importance of conditionalities see OECD, 2005 in Pieters pp.79-85.</p>	
<p>1.3. Effectiveness analysis: The effectiveness analysis (i.e. does the subsidy achieve its objectives?) should be based on the stated objectives of the policy. Where such goals are not explicitly stated or cannot be inferred, skip this section. Any environmental or social impacts would be considered unintended and would be addressed in the incidental impacts scan below (section 2 of the integrated assessment). This test is a sort of basic threshold criterion: if the subsidy fails at achieving even those objectives for which it aims then it is in need of reform regardless of its incidental impacts. So this is a powerful argument for reform. Possible sources: studies on macro-economic impacts or studies on micro-economic impacts of the subsidy. Please answer the points below.</p>	
<ul style="list-style-type: none"> • <i>Does the subsidy achieve the economic impacts that it is expected to achieve?</i> (e.g. correct a market failure; increase the supply of a public good) • What effect does the subsidy have on the (public?) budget and on welfare? 	<p>The tax exemption aimed to reduce the market price relative to conventional fossil fuels. The tax privilege was not meant to exceed the difference in the costs of production of biofuels and the price of conventional fossil fuels (i.e. it was not meant to over-support biofuels). A 2005 assessment by the Government however found that the tax exemption resulted in an overcompensation of €0.05/l for pure biodiesel and €0.10/l for blended biodiesel (Federal Finance Ministry, 2005). This overcompensation was subsequently amended by legislative acts in 2006 and 2007.</p> <p>When the amendment was proposed, the Government estimated that Germany would face a deficiency in tax returns of approximately €415 million/year for biodiesel and vegetable oil and approximately €100 million/year for bioethanol (European Commission, 2004). However, in reality, the size of the tax loss from the tax exemptions for biodiesel alone were estimated to be €559 million in 2004 (Federal Finance Ministry, 2005) and €900 million in 2005. These figures would increase even further if Germany was to achieve its target to increase the proportion of biofuels in total fuel consumption to 5.75% by 2010.</p>
<ul style="list-style-type: none"> • <i>Does the subsidy reach the intended recipients?</i> (e.g. improving income distribution generally, reaching a target group with intended benefits; inducing socially desirable behaviour). 	<p>Yes – biofuel producers benefited significantly from the tax exemption. However the tax exemption resulted in significant overcompensation - even at the relatively low oil prices prevailing in 2004 there were signs of substantial windfall-profits for biofuel producers (Ministry of Finance, 2005).</p>
<ul style="list-style-type: none"> • <i>Does the subsidy achieve its environmental objectives? – only relevant for those which have them</i> (e.g. reducing pollution; preserving habitat; encouraging the use of an environmentally preferable product, speeding the development of more-efficient or clean technologies). 	<p>To some extent the subsidy does achieve its environmental objectives as biofuels result in GHG emission savings and reduced depletion of non-renewable energy resources relative to fossil fuels (although when indirect emissions, including indirect land use change are taken into account, the GHG savings of conventional biofuels could be negated). At the same time the wider environmental impacts of the subsidy in terms of emissions causing acidification and increased nutrient inputs to soil and water bodies are significantly higher than those related to fossil fuels and may contradict wider environmental objectives of the Government.</p>

1.4. Cost-effectiveness: what alternatives exist for meeting those objectives that might be more cost-effective? In other words, could the objectives of the subsidy be achieved by other, more cost effective policies? Suggestion: one way of doing this is by comparing the cost of subsidy per unit of product with the cost per unit of an equivalent product. Note this step helps set the stage for the analysis of the impacts of policy reform. While collecting new, detailed information on the cost effectiveness of alternative policies, if not readily at hand, can be time consuming and costly, the analyst should at least consider and describe alternative policies

<ul style="list-style-type: none"> • <i>What alternative policies exist for meeting those objectives?</i> Please describe: 	<p>While recognising that EU biofuels policy has evolved since the time of the 2004 tax exemption in Germany, and that there are now new targets for Member States to achieve with regard to the use of renewables in transport fuels and new sustainability criteria in be met; there have been a number of studies indicating that promoting biofuels is not a cost-effective GHG emission abatement strategy. The Scientific Advisory Board on Agricultural Policy found that German bioenergy policies have relatively high CO₂ equivalent mitigation costs amounting from €150 to over €300 per tonne of CO₂ equivalent (Isermeyer et al, (2007). At the EU level, the cost per tonne of CO₂ equivalent avoided is estimated to be between €575 - €800 for ethanol from sugar beet and between €600 - €800 for biodiesel from rapeseed (Kutas et al, 2007).</p> <p>Alternatives that are considered to be more cost effective options for the abatement of GHGs include:</p> <ul style="list-style-type: none"> • Using bioethanol from more efficient sources, e.g. Brazil • Using biomass for stationary heat generation or for combined heat and power generation (CHP) - more energy can be gained and more emissions saved by stationary rather than mobile applications of biomass. This is particularly valid for the German context, where the power plant sector contains a high share of coal based power plants • Enhancing the efficiency of conventional power plants • Encouraging the development of second generation biofuels based on synthetic biofuels, e.g. bioethanol from lingo-cellulosic biomass and biodiesel from biomass gasification (biomass-to-liquid BTL) and other bioenergy technologies such as biogas or combustion • Reducing emissions in the transport sector through fuel-saving approaches such as speed limits and fuel economy standards has much greater potential for reducing GHG emissions and energy supply vulnerability and can be achieved at a lower cost • Taxes related to the carbon content of fuels, including biofuels, would be more cost-effective as they target CO₂ emissions directly. • Developing transport demand management strategies
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3.3.2 Incidental Impacts

The analysis of incidental impacts asks what impacts have occurred, or might occur, in areas (environmental/economic/social) not foreseen or targeted in the original subsidy design. The stress here is on long-term, dynamic and international impacts (e.g. this includes any impact of the subsidy on foreign producers – which should be noted in the analysis).

<ul style="list-style-type: none"> • <i>What are the unintended economic impacts of the subsidy?</i> (e.g. unintended economic impacts such as impacts on the prices of factors of production and intermediate inputs used by non-target 	<ul style="list-style-type: none"> + Improvements in the exploitation of auxiliary materials during extraction and transesterification + Technical maturity of the transesterification process + Improved operation and maintenance through larger installations, thus decreasing processing costs + Increased supply of by-products, such as rapeseed cake sold as livestock feed, thus decreasing prices of these products - Increased prices of other agricultural products due to increased competition for acreage, thereby one factor contributing to rising commodity prices.
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<p>industries; or economic impacts of social and environmental changes brought by the subsidy).</p>	
<ul style="list-style-type: none"> • <i>What are the unintended social impacts of the subsidy? (e.g. socially undesirable distributional impacts such as on low-income consumers, on non-target population generally, on developing country exporters).</i> • <i>Are there any impacts on social groups in third countries deriving from the existence of the subsidy? If yes, describe them. Are they important?</i> 	<ul style="list-style-type: none"> - Biomass production can contribute to aggravating existing food shortages by giving rise to price increases for agricultural products in response to growing demand created by profitable biomass processes (SRU, 2007). + Biomass production may also help to generate income and thereby improve food supplies (SRU, 2007) - Benefits of the tax exemption were largely captured by large, agro-industrial companies capable of producing large quantities of biofuels or by petroleum companies using cheaper non-domestic production for their blends (ETBE). - While the production of biomass is labour intensive, Schmitz et al (2003) (quoted in Wuppertal 2005) claim the employment effects in distilleries are rather small, due to the high degree of mechanisation. This effect on production structures leads to only very modest income effects for the farmers. - The food-fuel balance also has significant economic and social implications beyond Germany's borders, as increasing demand for biofuel feedstocks crowds out feedstocks for food purposes and is one factor contributing to increasing commodity prices in world markets, with subsequent effects on producers and consumers in third countries.
<ul style="list-style-type: none"> • <i>What are the unintended environmental impacts of the subsidy? These are mainly linked to primary economic impacts – changes in the levels of inputs and wastes e.g. degradation of ecosystem services; loss of biodiversity, synergistic effects. See also your answer to linkage 3 in the quick scan.</i> 	<ul style="list-style-type: none"> - Direct impacts include increased emissions causing acidification, nutrient inputs to soil and water bodies, and ozone depletion, degradation of biodiversity, ecosystem services and soil fertility, increased rate of soil erosion, excessive water abstraction and water pollution. In certain cases, the cultivation of certain biofuel feedstocks may result in a net increase in GHG emissions. - Indirect impacts from indirect land use change include GHG emissions if the area of arable land is increased and the carbon stored in undisturbed soils and forests is released, accelerated deforestation, runoff of nutrient and pesticides, loss of biodiversity etc both domestically and internationally - The subsidy also has derived impacts – rather than contributing to the reduction of fuel consumed, by offering a cheaper alternative it serves to increase demand for cars and encourage more driving – which in turn results in further emissions (although to a lesser extent than if fossil fuels were used). In this instance, the tax exemption seems contrary to the objectives of the ecological tax reform (ETR) laws (initiated in 1999) which aimed to lower energy consumption, raise energy efficiency and reduce environmental pollution through the gradual increase in the price of energy sources.

3.3.3 Long-Term Effectiveness

<p>Too often, a subsidy designed to solve a short term problem may easily become the cause of problems in the longer term. In this section, the analyst needs to ask whether the subsidy is merely treating the symptoms of a larger problem, or whether it actually addresses underlying causes. The assumption is that, if the former is true, the subsidy may in fact be delaying necessary structural change.</p>	
<ul style="list-style-type: none"> • Is the subsidy designed so as to eventually 	<p>The tax exemption does not spur innovation / competitiveness in the domestic market - by not distinguishing support between the different</p>

address the economic underlying problems that gave rise to its creation? e.g., by spurring innovation, increasing resource or labour productivity or increasing the supply of a public good?	types of biofuels it perpetuates the same kind of behaviour by producers. The tax exemption serves to obstruct market processes and the adoption of the most cost-effective ways of achieving GHG reductions. However, the 2004 law included regular reviews of overcompensation to ensure that the support remains relevant - this review process is what stimulated reform of the subsidy in 2006.
<ul style="list-style-type: none"> Is the subsidy aimed at addressing underlying social problems or to treat symptoms, and therefore perpetuating a social 'lock-in'? 	The support does not have a strong social rationale in Germany, however by increasing demand for biofuels feedstocks it indirectly acts to support farmers income.
<ul style="list-style-type: none"> Is the subsidy designed to directly address the environmental problems (e.g. problems facing infant industries)? 	No - the subsidy does not distinguish between biofuels according to their carbon intensity, GHG emission savings, type of feedstocks used, production methods employed etc. Thus there is no incentive to avoid environmental damage or even to ensure GHG emission reductions.

3.3.4 Policy Reform

This is the final stage in the analytical framework. It involves highlighting the costs and benefits of the various options for reform, including outright elimination of the subsidy, phased elimination, changed policy design, and alternative measures. The analyst will also need to ask what sort of flanking measures might be considered as a palliative complement to the various reform options.	
<ul style="list-style-type: none"> What would be the environmental, economic and social impacts of various scenarios for reform of the subsidy, including outright elimination, phased elimination, and change in policy design? Would they differ from a simple reversal of the incidental impacts discussed above? 	<p>Outline of policy reform in Germany (2006 - to date)</p> <p>In August 2006, in light of the significant burden of the tax exemption on the public budget and the rising price of petroleum products, the Government introduced the Energy Tax Act (<i>Energiesteuergesetz</i>) which established a system of gradually increasing taxes on biofuels between August 2006 (€0.09/l for pure biodiesel and €0.15/l for blended biodiesel) and 2012 when taxes would reach €0.45/l (almost matching the full tax rate for diesel fuel of €0.47/l). This measure aimed to take into account the overcompensation detected relative to fossil fuels.</p> <p>In 2007 the Government adopted the Biofuel Quota Act (<i>Biokraftstoffquotengesetz</i>) which sought to reduce the impact of the introduction of taxes on biofuels. From 2007, firms that market fuels were obliged to market a legally prescribed minimum percentage (quota) in the form of biofuels. From 1/1/2007, the level of the quota in relation to energy content was 4.4% for diesel and 1.2% for petrol. The quota for petrol rose to 2.0% in 2008, 2.8% in 2009 and 3.6% in 2010. From 2009, a combined quota of 6.25% was introduced for both fuels, which will gradually increase to 8% in 2015. The minimum rates for petrol and diesel will continue to apply. Biofuels required to fulfil the quota will be subject to full taxation (€0.47/l for blended biodiesel). A degressive tax exemption is retained for a transitional period until the end of 2011 for pure vegetable oil (rising from €0.09/l in 2008 to €0.45/l from 2012) and pure biodiesel (rising from €0.14/l in 2008 to €0.45/l from 2012) outside the quota. Second-generation biofuels, biogas and pure bioethanol (E85) are granted a higher but also degressive tax incentive until 2015 (whereas no tax was levied on these fuels previously). The Biofuel Quota Act couples support for biofuels with compliance of fuel standards (DIN EN 14214 for biodiesel, DIN EN 15376 for bioethanol and DIN EN 51605 for vegetable oil).</p> <p>In June 2009, the Parliament adopted an amendment to the Federal Emission Control and Energy Tax Law (law on the promotion of biofuels) which reduced the combined quota applicable in 2009 to 5.25% and keeps it fixed at 6.25% for</p>

the period 2010 to 2014. The quota system was said to be over-ambitious and technically not compatible with the existing car fleet given the failure to introduce E10 gasoline blend following protests from car importers, issues relating to car technology and standardisation issues, and the slow development of second generation biofuels. The quota for petrol is maintained at 2.8% for the 2010 to 2014 period. The amendment also reduced the increase in tax for pure biodiesel (which will be €0.18/l in 2009 rising to €0.45/l from 2013) and on vegetable oil (which will be €0.18/l in 2009, rising to €0.45/l in 2012). In the future, bio methane from biogas will be considered in the total and the petrol quotas. The amendment also changed the calculation basis for the biofuels mandate from energy content to net GHG reductions from 2015.

The Government intended to use the authorisations provided in the Biofuel Quota Act to ensure that only biofuels produced from biomass cultivated in compliance with the sustainable management of agricultural areas or certain requirements for the conservation of natural habitats are taken into account for the purposes of meeting the quota requirement or supported through tax measures. A new Section 37d was inserted in the Federal Immission Control Act (BImSchG), which empowers the German Government to enact ordinances under which specific products can no longer be counted towards the compulsory quota. Important criteria subsequently developed are minimum requirements for the management of agricultural land or for the conservation of natural habitats, plus a minimum level of CO₂ avoidance (SRU, 2007). In light of this amendment as well as obligations arising under the EU Directive on the promotion of energy from renewable resources (RED), the German Bundestag adopted the **Biomass-electricity-sustainability-ordinance** in July 2009. The ordinance entails sustainability requirements for liquid biomass used for the generation of electricity under the Renewable Energy Sources Act (Erneuerbare Energien Gesetz, EEG). In line with the sustainability requirements of the RED, the ordinance includes the protection of certain areas of high natural values, GHG savings and reporting obligations on progress in alleviating impacts on soil, water and air. Compliance with sustainability requirements should mostly be proven by certification schemes. Agricultural practice has to meet the cross compliance regulations. Certification and product documentation will be required from January 2010 onwards. A draft of a corresponding **ordinance for liquid biomass used in the transport sector is expected by the end of 2009**.

Impacts of reform

The gradual elimination of the tax exemption for biofuels had an immediate and significant effect on the domestic biofuels industry. There was a dramatic **drop in biodiesel sales** in Germany, with reductions in sales up of 30-40% (in 2008 biodiesel sales were half that of 2005) and stocks in the sector plunged. This is in part due to price increases, as the application of taxes on biofuels made biodiesel less attractive compared to conventional diesel. Initially the drop in sales was cushioned to some extent by high fossil fuel prices, however falling fuel prices reduced the price differential between biofuels and fossil fuels (which were 10 cents cheaper in February 2009). Coupled with high prices of feedstocks, this resulted in significant cuts in production. A number of trucking companies switched back to using fossil fuels and the number of filling stations offering pure biodiesel dropped from 1,900 to only 250. With the closure of many petrol stations supplying biodiesel, many truck fleets have resorted to refuelling biodiesel in neighbouring countries to an increasing extent (Schill, 2009).

In January 2008, the German biodiesel industry was said to be producing at only 10% of its **production capacity** (approximately 4.8 million tons per year), down from 20% in November 2007. In 2009, around 20% of capacity was being utilised. Large, established biodiesel producers such as Verbio AG, Petrotec AG and Biopetrol AG are cutting back production, while smaller and newer companies, especially those located in eastern Germany, are experiencing more problems and in some cases have reduced production to zero. Several smaller biofuel refineries have closed and a number of other production plants are

	<p>expected to be closed down and sold abroad. In response to the introduction of tax exemptions, a German biodiesel producer Plantanol launched a legal challenge against the German authorities; in 2009, the European Court of Justice ruled that the Government's 2006 decision to gradually eliminate tax exemptions did not breach EU laws on biofuels and energy taxation (C-201/08).</p> <p>In terms of market shares, the production of pure biodiesel (B100) and plant oil has been significantly reduced and the market for B100 is said to have collapsed. UFOP and other biodiesel supporters have complained that the mandated quota will hardly compensate for the loss of B100 sales, providing a market for only 1.5 million metric tons (450 million gallons) at a B5 blend. The blend market is expected to improve some as Germany moves towards a new B7 blends approved in January. Germany is among the first in the EU to develop standards for a B7 blend, which will boost the blend market in Germany to 2.1 million metric tons (630 million gallons).</p> <p>Over 90 percent of biodiesel used for blending in Germany is imported, with a significant proportion coming from the US where producers benefit from US subsidies for B99. German producers have been ardent supporters of imposing countervailing duties on these subsidised imports. In July 2009, the EU decided to impose anti-dumping duties and countervailing duties on imports of biodiesel originating in the United States. The anti-dumping duty rates will range from €68.6 per ton to €198 per ton net. The countervailing duty rates will range from €211.2 per ton to €237 per ton net. The measures would last five years.</p> <p>A change in the calculation basis for the biofuels mandate from 2015 from the energy content to GHG savings is expected to result in a slower expansion rate for the use of biofuel than has been the case to date (UFOP, 2009).</p> <p>A shift from tax exemption to a quota system alleviates the budgetary pressure caused by the tax exemptions. It shifts the burden of support of the biofuels sector (within the quota) from the Government to the consumer and thus increases fuel prices for the final consumer (thus applying the polluter pays principle).</p>
<ul style="list-style-type: none"> Where negative impacts are predicted, what sorts of flanking measures might be helpful in addressing the negative impacts? Conditions necessary for successful transition have been analysed by Cox A. in OECD 2007, also some examples of compensation have been included in IEEP et al. (2007) 	<p>In order to offset the impact of the application of gradually increasing tax rates on sales, the mandatory quota was established as a regulatory support measure to oblige companies bringing fuels onto the market at fiscal warehouse level to comply with specific and increasing minimum quotas for biofuels supplied to the market. While mandatory blending quotas were considered an important "safety net", they were often not considered sufficient and with a limit to the amount of biodiesel that could be sold to the mineral oil industry given the 5% blending requirement of the European Diesel fuel Standard EN 590, there were significant concerns regarding overcapacity in the domestic biofuels industry. There were calls for a change to the European standard for diesel fuels to allow a 10% admixture of biodiesel.</p> <p>In order to address the environmental concerns related to biofuels production, the Biofuels Quota Act included provisions for the development of sustainability ordinances which would ensure that only biofuels produced from biomass cultivated in compliance with the sustainable management of agricultural areas or certain requirements for the conservation of natural habitats are taken into account for the purposes of meeting the quota requirement or supported through tax measures. Setting sustainability requirements not only for biofuels, but for all energetic uses of biomass and also for other sectors of biomass use ensures that non-sustainable production is not merely relocated to other areas as production of biomass for biofuels becomes sustainable. Thus the recently adopted Biomass-electricity-sustainability-ordinance and the soon to be agreed ordinance for liquid biomass used in the transport sector are positive steps in this direction. However it is important to note that certification can only influence the supply chain, in that it can be used to modify farming and biomass harvesting methods to limit the environmental impacts of cultivation. However certification cannot be used to control the indirect impacts that arise from biofuels production, most notably the</p>

	<p>displacement of existing farming activities by an expansion of biofuel production and associated land-use change outside the area cultivated for biofuel.</p> <p>The removal of the tax exemption may lead to possible employment gains from the use of public money elsewhere. The net effect on employment depends on relative labour intensities. A possible compensatory measure for workers in the biofuels industry that have lost their jobs is the provision of support for transition to new jobs such as through various retraining programmes etc.</p>
<ul style="list-style-type: none"> • What would be the impacts of subsidy reform on trade? Would the removal of a subsidy have spill-over effects, i.e. favouring production overseas, favouring industry moving abroad? And what would be impacts on balance on the environment (please describe your assumptions and base your answer on a literature review – clearly specifying the literature consulted) 	<p>An OECD analysis of the implications of removing biofuels support policies in the EU (OECD, 2008) reveals that the order in which different support policies (budgetary support policies, biofuel mandates and import tariffs) are removed has an affect on the overall level of consumption and on trade. The elimination of budget support will result in a decrease in ethanol consumption in the EU of almost 30%, and a decrease in biodiesel consumption of approximately 15% on average over 2013-2017. Subsequent elimination of biofuel mandates and import tariffs will result in a total decrease in ethanol consumption in the EU of approximately 42% and of biodiesel consumption of 87%. In terms of production, the removal of budgetary support policies and mandates is expected to decrease ethanol production by approximately 35% and biodiesel production by approximately 20%. When the removal of import tariffs is included, ethanol production is expected to decrease by almost 80% and biodiesel production by approximately 85%. International trade in ethanol will decrease by the elimination of budgetary support and biofuel mandates, with EU net imports of ethanol decreasing by about two-thirds. However, a subsequent elimination of import tariffs would overcompensate the negative trade effects of the budget and mandate policies and result in a next increase in EU imports by some 130% on average for 2013-2017 period. Tariff elimination mostly affects ethanol production, given higher tariff rates applied.</p> <p>Increased demand for biofuels offers a number of potential opportunities for developing countries, including potential socio-economic benefits such as the encouragement of foreign investment and trade leading to job creation, better education and infrastructure. However, there are also a number of possible direct and indirect threats associated with such a dramatic increase in production, including widespread environmental damage, forced displacement, and increased instability in commodity markets. The relationship between biofuels and sustainable development is complex and depends on a number of different variables including, the type of energy crop grown, the method of cultivation and conversion technology employed, the national policy framework in place, existing conditions and alternative prospects facing the country in question. It is as yet unclear what the overall implications of an increase in demand for biofuels will be.</p>

Summary of the application of the integrated assessment to the case study	
1. Is the subsidy <u>currently</u> justified by any relevant market failure (<i>such as lack of competition, lack of market transparency, or uninternalised external effects – note these may have been valid reasons for the introduction of a subsidy, but they may have disappeared over time</i>)	No - the subsidy cannot be justified given the maturity of the biofuels industry. First generation biofuels can be produced using mature, well established processes and no longer require additional support.
2. If yes, is there an alternative way to tackle that market failure?	N/A
3. Is the subsidy <u>currently</u> justified by any strong social concern? (<i>Note: a number of subsidies were launched</i>)	No – the support does not have a strong social rationale in Germany

<p><i>where there was a strong social concern, although this may not always still be the case).</i></p>	
<p>4. If yes, is there an alternative way to tackle that social concern?</p>	<p>N/A</p>
<p>5. Have there already been attempts to remove this subsidy, and if yes, why they failed? (<i>eg opposition by vested interests, public perception concerns, lack of political will given negotiating capital</i>)</p>	<p>The original 2004 tax exemption has been reformed - see 'policy reform' section - point 1 - of the integrated assessment</p>
<p>6. Could you make recommendations on possible compensation measures that could be used to palliate impact of removal?</p>	<p>In order to offset the impact of a reduction in the tax incentives on biofuels sales; the mandatory quota was established as a regulatory support measure to oblige companies bringing fuels onto the market to comply with increasing minimum quotas for biofuels.</p> <p>In order to address the environmental concerns related to biofuels production, the Biofuels Quota Act included provisions for the development of sustainability ordinances which would ensure that only biofuels produced from biomass cultivated in compliance with the sustainable management of agricultural areas or certain requirements for the conservation of natural habitats are taken into account for the purposes of meeting the quota requirement or supported through tax measures.</p> <p>The removal of the tax exemption may lead to possible employment gains from the use of public money elsewhere. The net effect on employment depends on relative labour intensities. A possible compensatory measure for workers in the biofuels industry that have lost their jobs is the provision of support for transition to new jobs such as through various retraining programmes etc.</p>
<p>7. What would be the impacts on trade of the subsidy removal? Will it have any global environmental impacts?</p>	<p>The subsidy removal could have an impact on trade – 'policy reform' section, point 3, of the integrated assessment.</p>