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Encouraging  
Environmentally Sustainable  
Growth in Austria

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Andreas Wörgötter**

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**ENCOURAGING ENVIRONMENTALLY SUSTAINABLE GROWTH IN AUSTRIA**

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**Jens Høj and Andreas Wörgötter**

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## ABSTRACT/RÉSUMÉ

### ENCOURAGING ENVIRONMENTALLY SUSTAINABLE GROWTH IN AUSTRIA

This document analyses the economic impacts of selected environmental policies in Austria with an emphasis on the use of economic instruments and incentives versus command-and-control measures. An important theme in a federation like the Austrian is the institutional complexity involved in many aspects of environmental policy, requiring a high degree of co-ordination between various layers of government, which could be furthered by a coherent *ex ante* and *ex post* evaluation system. Such a system could also be useful in the setting of abatement objectives and minimizing their associated cost. Greater use of properly designed instruments, examples being a unified taxation of fuels and the introduction of a CO<sub>2</sub> tax, would improve the cost-effectiveness of policies to reach Austria's ambitious CO<sub>2</sub> emission reduction target. This would particularly be the case if economic instruments replace the widespread use of subsidies and command-and-control type measures. Such measures are found to have arbitrary abatement costs across activities. Changes are taking place, like the replacement of subsidies with guaranteed feed-in-tariffs to promote renewable energy sources, although the effectiveness of this policy change is thwarted by the multiplicity of tariffs in place. Moreover, part of the lacking cost-effectiveness of subsidies stems from them being directed towards inputs or processes rather than environmental outcomes -- an example being subsidies to housing, public transportation and agriculture -- pointing to the scope for improving targeting and resource allocation. The latter may also be underpinned by setting charges related to water and waste services on the basis of the full cost recovery principle.

*JEL Classification: H23, Q00, Q20, Q28, Q40, Q48*

*Keywords: Austria, sustainable development, environmental policy.*

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### POUR UNE CROISSANCE ÉCOLOGIQUEMENT DURABLE EN AUTRICHE

Ce document analyse les effets économiques de certaines actions environnementales en Autriche, en mettant l'accent sur l'utilisation des instruments économiques et sur les incitations, par opposition aux mesures coercitives. Dans un Etat fédéral tel que l'Autriche il faut souligner la complexité institutionnelle de maints aspects de la politique d'environnement, exigeant une étroite coordination entre les divers niveaux d'administration, qui pourrait être renforcée par un système cohérent d'évaluation *ex ante* et *ex post*. Pareil système serait également utile pour fixer les objectifs de dépollution et minimiser les coûts associés. Un plus ample recours à des instruments bien conçus, notamment une fiscalité unifiée des carburants et une taxe sur le CO<sub>2</sub>, améliorerait le rapport coût-efficacité des mesures destinées à atteindre l'ambitieux objectif de réduction des émissions de CO<sub>2</sub> que s'est fixé l'Autriche. Tel sera le cas en particulier si les instruments économiques remplacent les subventions généralisées et les mesures de type autoritaire. Celles-ci engendrent des coûts de dépollution arbitraires d'une branche d'activité à l'autre. Des changements sont en cours : ainsi, afin de promouvoir les sources d'énergie renouvelables, les autorités ont remplacé les subventions par des tarifs d'achat garantis, même si la multiplicité des tarifs en vigueur nuit à l'efficacité de cette réforme. Par ailleurs, le médiocre rapport coût-efficacité des subventions vient en partie de ce qu'elles sont axées sur les intrants ou les procédés et non sur les résultats environnementaux - c'est le cas des subventions au logement, aux transports publics et à l'agriculture -, d'où la nécessité d'améliorer le ciblage des mesures et l'allocation des ressources. Une tarification au coût réel des services liés à l'utilisation de l'eau et à l'élimination des déchets serait également souhaitable à cet égard.

*Classification JEL : H23, Q00, Q20, Q28, Q40, Q48*

*Mots clés : Autriche, développement durable, politique environnementale*

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## ENCOURAGING ENVIRONMENTALLY SUSTAINABLE GROWTH IN AUSTRIA<sup>1</sup>

by

**Jens Høj and Andreas Wörgötter<sup>2</sup>**

1. Environmental protection has a long tradition in Austria and was first mentioned in a legal context in 1969. Since 1984 there is a constitutional law explicitly obliging the various layers of government -- the federal government, the *Länder* and the municipalities -- to engage in comprehensive environmental protection. The explicit statement of environmental protection as a constitutional goal -- "*Staatsziel*" -- reflects the high importance Austria attaches to environmental issues. As a result, Austria has formulated ambitious environmental objectives and has in many aspects achieved a high standard for its environment. The population supports ambitious environmental targets and politicians can rely on a broad consensus for an environmental policy characterised by strict environmental legislation in terms of setting standards combined with a considerable amount of environmentally related public expenditures for environmental purposes, while it is rare that more market-based measures are applied. A major concern of Austrian environmental policies is that they have a common goal of reducing CO<sub>2</sub> and other greenhouse gases emissions -- although so far policies are unlikely to achieve the ambitious CO<sub>2</sub> reduction targets.

2. The next section outlines the environmental policy framework in Austria, including the institutional structure of competencies within the Austrian federation with respect to environmental issues as well as the use of evaluation systems. The following section looks into Austria's commitment under the EU burden sharing mechanism for the Kyoto protocol to reduce CO<sub>2</sub> emissions as an example of ambitious targets.<sup>3</sup> However, the applied policy mix to reach this target appears not to be balanced and its discussion dominates much of the space in this chapter. To the extent economic instruments are applied, they are not tightly targeted on environmental outcomes. Much is expected from "command-and-control" measures and from a re-directing of traditional subsidy programs towards environmental objectives, in such areas as public transport, housing and biomass energy. These themes are recurrent in other areas: water service providers receive large subsidies to finance infrastructure investments, waste disposal is characterised by detailed recycling regulations, and agriculture receives financial support for organic and other environmentally friendly production methods -- the former to the extent that in some markets supply

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1. This paper was originally produced for the OECD Economic Survey of Austria, which was published in December 2001 under the authority of the Economic Development Review Committee. Working papers on the same subject have been published for Norway, Finland, Germany, the United States, Denmark, Sweden, Canada, Poland, Belgium, France and Australia.

2. J. Høj and A. Wörgötter are economists in the OECD Economics Department. The authors thank Ann Vourc'h, Eckhard Wurzel, Jørgen Elmeskov, Mike Feiner and Paul O'Brien as well as colleagues in the OECD Environment Directorate, the European Conference of Ministers of Transport and the International Energy Agency for their comments, and Josette Rabesona and Diane Scott for technical assistance.

3. In July 2001, an agreement was reached in Bonn by all participating countries, with the exception of the United States, on a broad framework for implementing the Kyoto Protocol. Decisions are still outstanding on important matters, such as compliance mechanisms and sinks, making it difficult to assess the likelihood of timely ratification, or the specific implications of the Protocol with respect to any one Party.

exceeds demand. Bureaucratic decision making tends to pre-dominate in this policy mix. Relying more on market determined outcomes, with individual actors having more room to decide how best to achieve an environmental standard, would allow Austria to maintain its favourable balance between economic growth and a clean environment at lower costs.

### **The federal institutional structure**

4. The main legislative competence with respect to environmental issues within the Austrian federation is concentrated at the federal level, although the *Länder* are responsible for implementation of federal legislation in general as well as regional legislation in some important areas, such as spatial planning and building standards.<sup>4</sup> The *Länder* are financed through a negotiated revenue sharing system and earmarked transfers from the federal government. For instance in the area of housing policies, the individual *Land* is responsible for the design and allocation of housing subsidies (including the recently introduced opportunity to redirect subsidies to energy saving investments) and the federal government provides the financing. EU directives add an additional layer of competencies, having a direct influence on the formulation of environmental policy at the federal level (like the common agricultural policy and the current deregulation of gas and electricity markets) and with the *Länder* being involved in implementation. While potentially allowing for more subsidiarity, this division of responsibilities can lead to an ineffective policy design, as in the case of policies to promote renewable energy sources in a deregulated electricity market through guaranteed feed-in-tariffs. These are implemented across Austria, but with their levels determined by the individual *Land*, creating complex incentive structures concerning the supply of renewable energy sources, which may go beyond environmentally justified levels (see below).

5. The protection of the environment -- including strategies for sustainability -- is the joint responsibility of the federal and *Länder* governments with the National Environmental Plan from 1997 forming the basis for Austrian environmental policy, including policies to reach Austria's CO<sub>2</sub> reduction commitment. In accordance with the national policy, the federal government and each of the *Länder* are developing their own action programmes, encompassing several policy areas, such as measures to reduce CO<sub>2</sub> emissions through measures to promote renewable energies and improving the thermal efficiency in the housing stock (see below). However, individual policies in these fields are often pursuing multiple objectives, raising the issue of how to balance policies.

### ***Evaluation of new legislative initiatives***

6. Evaluation of specific projects or broader policies in terms of their environmental effects has not been mandatory in the past, although various evaluation and assessments techniques have been gaining ground. Evaluations of individual projects became mandatory with the Federal Act on Environmental Impact Assessment in 1994, amended in 2000 largely to comply with EU legal framework, requiring an assessment of the direct and indirect effects of each investment project on the surrounding environment as well as evaluating alternatives, replacing earlier more *ad-hoc* cost-benefit analysis of larger -- typically infrastructure -- projects.<sup>5</sup> Policies are not systematically evaluated in terms of their environmental impact, although environmental policies are assessed in terms of their economic effects at the federal level through

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4. Recently, there has been some concentration of federal competencies with the present government's creation of the Ministry of Agriculture, Forestry, Environment and Water Management. However, other ministries have retained their enforcement powers in relevant environmentally-related areas like environmental taxes (as part of the Ministry of Finance's overall responsibility for tax policies) and industrial regulation (Ministry of Economic Affairs and Labour).

5. Federal Ministry of Agriculture, Forestry, Environment and Water (2000).

a required regulatory impact statement for all bills presented to parliament. These take into account additional costs for public administration, other fiscal costs, the administrative burden for enterprises, direct effects of the bill on employment and external competitiveness, although economy-wide effects are not evaluated. The state of the environment is closely monitored with the Austrian Federal Environment Agency issuing a "State of the Environment Report" every three years (the latest from 2001) and with individual *Länder* issuing similar reports at regular intervals. Thus, there has been a move towards greater use of evaluation techniques, although formal mandatory quantitative analyses within a common framework are still to emerge.<sup>6</sup> The United States, for example, is using a common evaluation framework in that mandatory Environmental Impact Statements list the environmental consequences of planned federal government policies and investments and the Office of Management and Budget publishes tables showing the monetised costs and benefits of "economically significant" rules.<sup>7</sup> Naturally, such evaluations come with many caveats, but using standard frameworks for evaluating costs and benefits could form a basis for comparing policies and thereby contributing to a more consistent and cost-efficient implementation.

7. The Austrian civil law plays a limited role in ensuring an even application of environmental legislation and in enforcing the polluters-pay-principle. In certain cases, affected individuals may apply for an injunction even if the polluter is in compliance with the law, although the burden of proof -- often considered difficult and costly -- lies with the complainant, thus possibly restricting legal action. Furthermore, third parties -- i.e. citizens or NGOs not directly affected by pollution -- cannot take legal action against the polluter, limiting non-involved parties from using the legal system. On the other hand, third-party action can be taken against government agencies for non-enforcement or non-implementation by bringing a liability lawsuit. Even though specific conclusions concerning the appropriate place of the legal system in environmental policies are difficult to draw, the tendency in other countries is that compliance with the law cannot always be used as a defence and that NGOs have generally the right to take polluters to court, indicating greater scope for using the legal system.<sup>8</sup>

8. The focus on subsidies and regulatory measures, such as command-and-control instruments, leaves enforcement to administrative action and generally does not allow for much individual scope of how to comply with the law. Moreover, firms only face limited cost of polluting as long as they keep their pollution and emissions below the environmental standards.<sup>9</sup> Indeed, firms are not required to compensate for environmental damages as long as standards are met. At the same time, there is limited use of economic instruments or measures providing financial incentives to change environmentally-damaging behaviour. Environmental goals are therefore in some cases introduced without an integrated catalogue of measures to reach them. Furthermore, Austrian fiscal federalist arrangements lead to a low emphasis on efficiency considerations at the implementation level (the *Länder*), since associated fiscal costs are financed by the federation's revenue sharing mechanism, such as in the case of housing subsidies.

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6. For a description of various valuation techniques, see O'Brien and Vourc'h (2001).

7. OECD (2000a).

8. See table 2 in O'Brien and Vourc'h (2001) for an overview of legal practises in various OECD countries.

9. Firms' compliance costs are equal to the investment costs of reaching the publicly-determined standards and additional costs for below legal standards pollution or emissions only insofar as economic instruments, such as environmental taxes, are in place.

### Austria's CO<sub>2</sub> reduction target under the Kyoto protocol

9. Austria has clear quantifiable objectives with respect to green house gas emissions.<sup>10</sup> Under the Kyoto protocol and the related EU's burden sharing mechanism to reduce EU-wide emission of green house gases by 8 per cent Austria has adopted a more ambitious target of reducing CO<sub>2</sub> equivalents -- measuring all green house gases in terms of CO<sub>2</sub> -- by 13 per cent by 2008-12 relative to the level in 1990.<sup>11</sup> This should be viewed in the light of Austria -- with an energy intensity slightly below that of other countries -- having a lower than average CO<sub>2</sub> intensity as compared with other OECD countries, to a large part explained by the high share of hydropower in electricity generation (Figure 1). The relatively low CO<sub>2</sub> intensity, however, also implies that abatement costs -- the cost of reducing emissions -- in Austria would tend to be higher than in other countries, pointing to potentially large benefits from the application of economic instruments including international trading of CO<sub>2</sub> emissions.<sup>12</sup>

10. By 1999 the CO<sub>2</sub> emissions (measured in CO<sub>2</sub> equivalents) were somewhat higher than in 1990, mostly related to higher energy consumption and despite some progress in replacing high CO<sub>2</sub> content fuels with natural gas (Figure 2). Extrapolation of historical trends for CO<sub>2</sub> emissions indicates a further modest increase in overall emission by 2008-12.<sup>13</sup> While already implemented measures are expected to reduce CO<sub>2</sub> emissions by as much as 5-6 per cent by 2005, it is unlikely to be sufficient to allow Austria to reach its emission reduction targets. It would therefore appear timely to reconsider the chosen policy.<sup>14</sup>

11. Policy measures reviewed in the following sections to reach the CO<sub>2</sub> emission targets reflect the fact that two-thirds of all CO<sub>2</sub> emissions originating from electricity generation, transport and space heating. Besides the few economic instruments applied, policies include regulation mainly in the areas of traffic, building standards and heating. Substantial subsidy programmes are applied to promote renewable energy sources, higher efficiency in energy use (in particular for space heating), enhanced efficiency in energy transformation, including co-generation in the industrial and residential sector, and an improvement of transport infrastructures to increase the market share for public transportation. However, the sparse application of cost-benefit analysis means that little attempt has been made to ensure the cost-effectiveness across policies. It therefore appears that a better balance between these instruments could achieve environmental standards at lower costs.

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10. The first numerical target for reducing CO<sub>2</sub> emissions was introduced after the 1988 Toronto Conference when Austria adopted a national target of reducing CO<sub>2</sub> emissions by 20 per cent in 2005 as compared with the 1988 level

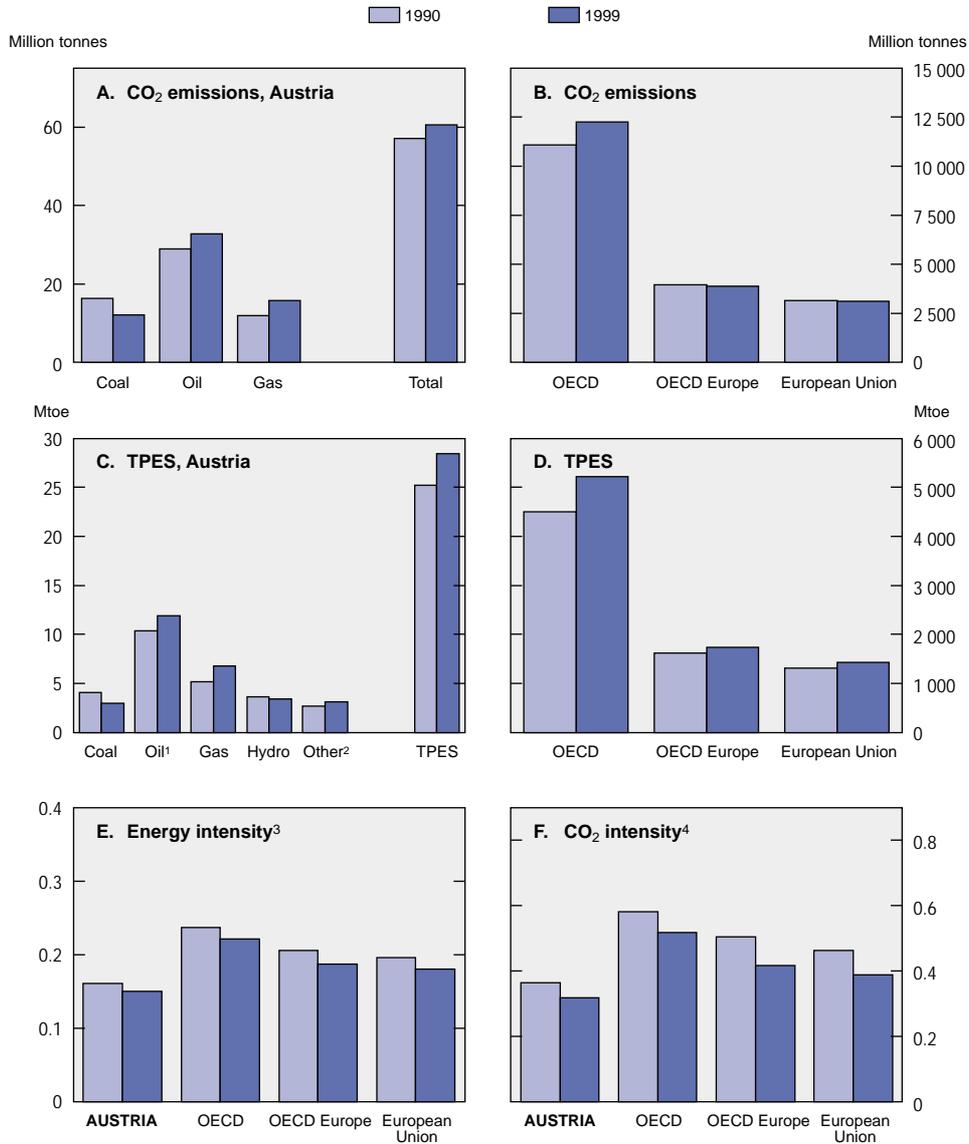
11. OECD (1999a).

12. In general economic instruments aims at ensuring that the value of the marginal damage to the environment is equal to the marginal cost of abatement, thereby securing that polluters pay in accordance to the damage they inflict on the environment and that the cost of reaching a given level of abatement is minimised. The advantage of introducing international trading is that these advantages of economic instruments are being extended to the international level.

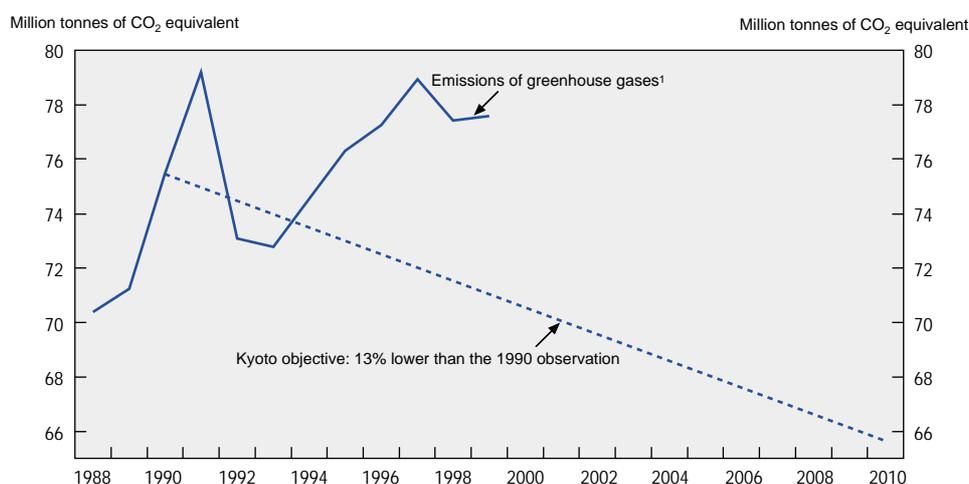
13. However, taking into account temperature and production variations, Austria's CO<sub>2</sub> emission in 1992 and 1993 was 7½ per cent lower than if production and temperature patterns had been normal. Overall for the period 1990 to 1997, the measured CO<sub>2</sub> emission was 2.5 per cent lower than when adjusted for variations in temperature and production. See Schleicher *et al* (1999).

14. IEA (1998).

Figure 1. CO<sub>2</sub> emissions and total primary energy supply (TPES)



1. Including crude oil, NGL (natural gas liquids), refinery feedstocks and petroleum products.  
 2. Combustible renewable, waste, electricity and nuclear.  
 3. TPES divided by GDP (1995 prices using 1995 US\$ PPPs).  
 4. CO<sub>2</sub> emissions divided by GDP (1995 prices using 1995 US\$ PPPs).  
 Source: IEA, *Energy Balances of OECD Countries* and *CO<sub>2</sub> Emissions from Fuel Combustion*.

Figure 2. CO<sub>2</sub> emissions: historical developments and objectives

1. Sum of CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> in million tonnes of CO<sub>2</sub> equivalent.

Source: Austrian Federal Environment Agency and OECD.

### *Economic instruments*

12. Environmental taxes refer in their strictest sense to taxation of each unit of pollution, thereby imposing equal marginal abatement costs across activities as economic agents minimise costs. However, even using a wider definition from the OECD database on environmentally related taxes including all taxes levied on tax bases with a particular relevance for the environment, Austria is relying relatively less on environmental taxes (measured as a share of GDP) than other European OECD countries. Most of those in place predate the debate considering the tax system as a tool to promote environmental goals. Only the energy tax was introduced in 1996, while the introduction of environmentally relevant car characteristics in the calculation of the car registration and operating taxes dates back earlier. Environmental taxes in Austria are largely related to taxation of energy (energy tax imposed on electricity and natural gas and mineral oil tax) and there are significant tax exemptions in place, which are independent of environmental considerations.<sup>15</sup> For competitiveness reasons the energy tax for goods producing firms has been restricted such that tax payments cannot exceed 0.35 per cent of the net production value.<sup>16</sup> This restriction effectively means that a substantial share of all energy consumption faces no incentives from the energy tax to economise on energy. In terms of tax revenues the mineral oil tax is more important with €2.7 billion.<sup>17</sup> From an environmental point of view the complete tax exemption of coal is rather unfortunate and should, together with all other exemptions, be abolished as exemptions increase the cost of reaching any targeted reduction in CO<sub>2</sub> emissions (see Box 1). More generally, environmental taxes should be geared towards various environmental objectives -- such as reducing CO<sub>2</sub> and other emissions -- to ensure that marginal abatement costs are equalised across activities.

15. The exemptions are, in the case of the energy tax: coal altogether, gas used for other purposes than heating as well as gas and electricity used for the production and transport of energy and in the case of the mineral oil tax: fuels used for aeroplanes, ships and trains, refineries, blast furnaces, combined heat and power plants and electricity generation.

16. OECD database on environmentally related taxes.

17. The revenue of an environmentally related tax is a poor gauge for its effectiveness, as the most effective environmental taxes will have close to zero revenue.

### Box 1. Competitiveness: a valid reason for sub-optimal environmental taxation?

Competitiveness issues have always been a stumbling block to the implementation of a pure CO<sub>2</sub> tax. Indeed, countries applying such a tax (*e.g.* the Nordic countries and Germany) introduced substantial tax-exemptions from the start to avoid distorting external competitiveness. The arguments traditionally used against the unilateral implementation of a CO<sub>2</sub> tax applied to all sectors centre around the fear of exposing industries subject to international competition to a loss in external competitiveness in the pursuit of domestic environmental objectives. This would result ultimately in the relocation of work places without any global reduction of CO<sub>2</sub> emissions.<sup>1</sup> Consequently, the 1996 Austrian energy tax on natural gas and electricity introduced rather moderate rates as well as an upper ceiling of 0.35 per cent of net production value for goods producing firms, and excludes coal and renewable energy sources altogether.<sup>2</sup>

However, the main purpose of a CO<sub>2</sub> tax is to reduce the activities of the most polluting industries or make them change their production methods. The loss of employment (and regional aspects) has to be dealt with in the same manner as with other structural changes in the economy. Moreover, it is important to recognise that exemptions for heavy polluters are costly: other domestic industries or activities are disadvantaged with respect to the protected industry; and overall costs of dealing with the environmental problem are increased. To reach a given level of pollution abatement, exempting some activities means that the tax rate or degree of regulation on others has to be higher, leading to a higher-than-otherwise contraction of the non-exempted activities, with a likely higher overall loss of output (given the larger reliance on reducing less pollution-intensive activities) than compared with a no exemption situation. General equilibrium model numerical simulations indicate that if export orientated sectors are compensated to maintain their external competitiveness, a CO<sub>2</sub> tax that is 40 per cent higher for a given CO<sub>2</sub> reduction target is necessary.<sup>3</sup>

For a small and open economy like Austria, there are nevertheless real concerns that some enterprises, if hit by a substantial CO<sub>2</sub> tax, could be bankrupted or would choose to relocate to another country unnecessarily. The latter refers to the situation that once other countries also have acted in this field, the operation of the enterprises in Austria would become viable again. To soften the impact on external competitiveness and preserve abatement incentives a range of alternative economic instruments could be used. Among the measures applied in OECD countries are tax credits (as in Sweden for NO<sub>x</sub> emissions), reduction of other distorting taxes (such as taxes on labour) or tradable permit schemes (as in the United States for sulphur and -- in some states -- NO<sub>x</sub>). All these measures reduce the competitive disadvantage of environmental taxes for large polluters without diminishing their environmental incentives. An extension of the latter system could be the creation of an international market for greenhouse gas emission permits, which would reduce the overall costs of meeting the Kyoto target by allowing the emission reductions to take place where abatement costs are lowest.

The design of a CO<sub>2</sub> tax may have different effects on the economy depending on whether the tax is offset by a lowering of payroll taxes, making it revenue neutral.<sup>4,5</sup> However, reducing the marginal abatement incentives for the major offenders on competitiveness grounds is not efficient and is rarely the only means available to reduce adjustment costs.

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1. It should be remembered, though, that given that relatively limited taxes may have the required effects, the external competitiveness will be influenced by other factors too, such as the exchange rate or the wage rate.
  2. Insofar as the energy tax aims at reducing CO<sub>2</sub> emissions, the exemption of renewable energy only reflects that they are CO<sub>2</sub> neutral.
  3. In addition, non-linear responses to individual policies could imply that combining policies may have migrating effects on the negative consequences. For example, an increase in the supply of biomass energy could lower the necessary tax to reach a given CO<sub>2</sub> emission target by a third or a half. See Breuss and Steininger (1998).

4. Some calculations have shown that the welfare cost of a CO<sub>2</sub> tax without rebates is much higher than when rebates are made either as a reduction in pay-roll taxes or subsidies to industries. However, these calculations did not include the welfare aspects of expanding the future manoeuvre-room for the fiscal policy. See Farmer and Steininger (1999).
5. Such measures are often assumed complementary in nature, although this may not be the case. For example, an improvement in heating system efficiency would lower the profitability of thermal isolation investments. See Wirl and Infanger (1985) for a more extensive discussion.

### *Private road transport*

13. The general principles behind the Austrian system of vehicle taxation (including road transport duty, vehicle registration tax and motor vehicle taxes) serves to reduce the environmental impact from different types of vehicles, underpinned by strict standards for catalytic converters and petrol quality as well as annual compulsory automobile inspections (including emission controls).<sup>18</sup> The vehicle taxation system of new cars includes a charge based on fuel consumption to promote more energy efficient vehicles as well as a monthly car registration tax dependent on engine specifications.<sup>19</sup> In addition, motorway passes (“vignettes”) were introduced in 1997 and their prices were doubled in 2001. Road pricing for goods transport is being implemented in accordance with EU rules, being based on the cost recovery principle, which may include damages to infrastructures but not environmental costs.<sup>20</sup> The current system of road pricing is far from recovering the costs of maintaining the extensive Austrian highway system. The tolled highways are allocated to *ASFINAG*, a 100 per cent federally owned company, founded in 1997, ensuring that no transfers from the federal government has been necessary since an increase in share capital in 1997.<sup>21</sup> The application of a full cost recovery pricing principle should be introduced to terminate the current environmentally damaging subsidisation of road traffic in Austria. The environmental purposes of the vehicle taxation system are being further impaired by tax-exemptions granted to sectors or vehicle types without obvious beneficial effects on the environment, such as agricultural vehicles, taxis and rental cars. Such exemptions should be abolished altogether.

14. Minimising the distortion from external effects of road traffic on the environment requires that the marginal cost of car usage is set to be equal with its environmental damages, e.g. through instruments

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18. However, other elements of the tax system have negative effects on the environment as they promote transport activities, as in the case of deductibility of commuting cost. Indeed, there is a risk that road transport is promoted over of public transport as the value of the deductions for commuting by car is around twice as high as for commuting by public transportation subject to availability rules, although the final assessment would have to include all subsidies to the different types of transport. Kletzan (2000).

19. Moreover, other exemptions from the road transport duty include, among others, army vehicles, lorries for the transport of household waste, circus lorries, agriculture vehicles in agricultural use, taxis and rental cars.

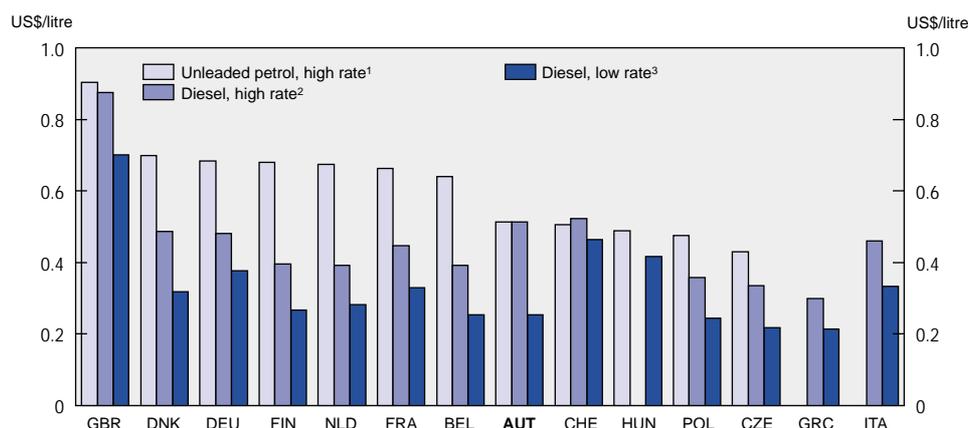
20. In the mid-1990s, taxation of private road transports was somewhat higher than associated infrastructure investment costs. Moreover, additional external costs arising from road transport, including traffic accidents and less easily measured costs as noise pollution, environmental damages and traffic congestion, has been estimated to be nearly €3.6 billion. Prior to EU accession, taxes and charges related to road transport amounted to more than 90 per cent of such costs. Consequently, such taxes and charges only covered about half of the total associated costs, adding external costs and infrastructure costs together. Bundesministerium für Wissenschaft und Verkehr (1997).

21. The structural loss situation of *ASFINAG* makes explicit guarantees and full ownership by the Austrian Republic necessary. See *ASFINAG* (2001).

like fuel taxes.<sup>22</sup> However, their use has been restricted by the perceived need to set gasoline taxes at levels low enough so as to discourage the so-called “tank tourism”.<sup>23</sup> The term refers to the situation where Austrians drive to neighbouring countries with lower gasoline prices to purchase gasoline, which thus lowers revenues without being accompanied by a reduction in emissions.<sup>24</sup> The setting of fuel taxation under the above restrictions has led to the level being below EU-member neighbours and Switzerland and above those of other non-EU member neighbours (Figure 3).

Figure 3. **Motor fuel tax rates in European OECD countries**

Q2 2001 or latest available, US\$



1. Premium unleaded gasoline (98 RON) for households.
  2. Automobile diesel for non-commercial use.
  3. Automobile diesel for commercial use.
- Source: IEA, *Energy Prices and Taxes*, Second quarter 2001.

15. The lower taxation of diesel than for other fuels (furthered by a fuel consumption levy introduced in 1992 and increased in 1996) has reinforced a trend towards a higher share of diesel-powered vehicles, accounting for two-thirds of new registered cars and more than a third of the stock, leading to a higher share of diesel in road fuels from 36 per cent in the beginning of the 1980s to nearly 60 per cent by the mid-1990s. However, from an environmental perspective taxation of diesel should be higher than that of gasoline as the carbon content is higher in diesel, the emission of NO<sub>x</sub> is about a third higher for diesel engines than for non-leaded petrol engines with catalysts.<sup>25</sup> Diesel engines also emit small particles,

22. Friedl and Steininger (2001) conclude that explicit costs increases in the form of road pricing is more efficient to achieve environmentally sustainable transport than implicit measures like congestion and regulation.
23. The ongoing implementation of the Green tax reform in Germany implies that fuel taxes are being increased, increasing the scope for higher Austrian fuel taxes (see OECD 2001a).
24. Economy-wide effects of a 10 per cent increase in the differential in transport fuel prices between Germany and Austria is estimated to lower sales of gasoline and diesel by around 3.0 and 3.4 per cent, respectively. See Puwein (1996).
25. Pre-tax prices on unleaded gasoline and automotive diesel are generally higher than in other European OECD countries, which could be an indication of limited competition in the markets for fuels. Environmentally motivated taxes may thus serve to magnify differences in product market competition, thus exaggerate existing differences in abatement costs across fuel types.

although volatile organic compounds (VOC) emissions are higher for petrol engines.<sup>26</sup> On the other hand, setting tax rates that fully reflect emissions is difficult as the emissions of small particles -- as well as for other important pollutants, such as NO<sub>x</sub> and VOCs -- are particularly dependent on engine technology and driving conditions.<sup>27</sup> The determination of tax rates for diesel is to a large degree based on sector considerations. Diesel tax rates are very similar across countries, which may be explained by the trucking industry's use of modern long-distance vehicles, allowing for purchasing of diesel at will along the international route network.<sup>28</sup> However, the current low taxation of transportation fuels in Austria does allow for a higher degree of ecological consideration in the determination of tax rates without having to fear distorting reactions in the form of "tank-tourism".

16. The present system of energy taxation does serve to reduce CO<sub>2</sub> emissions as a result of the general restraint of demand. However, the costs of abatement are discriminatory as the implicit taxation of CO<sub>2</sub> arising from the current system varies considerably across different types of fuel. In general, the rate on fuels primarily used for transportation purposes is much higher than on fuels primarily used for space heating and usage in industrial production (Table 1). The relative differences, however, do not reflect the content of other pollutants, such as particles or other emissions. Nevertheless, the current energy tax system places a 5 to 10 times higher burden on transport as regards reduction of CO<sub>2</sub> emission as it does on space heating and industrial production, a difference which cannot be explained by the relative content of other pollutants, but may partly reflect other external costs. A re-calibration of taxes in order to reach the Kyoto target should therefore be considered in order to reduce the differences of abatement costs.

Table 1. **Implicit CO<sub>2</sub> tax rates on different types of fuel**

	€/tonne CO <sub>2</sub>
Gasoline	127
Diesel oil	85
Gas oil	21
Heavy fuel oil	11
LPG	12
Natural gas	23
Coal	0
Electricity	..

*Note:* Pre-fund industry for limiting energy tax to 0.35 per cent of value added.

*Source:* Austrian Government.

17. While energy taxes are imposing some costs on emissions, only a tax on emissions will minimise abatement costs. Indeed, CO<sub>2</sub> taxes are becoming more widespread in the OECD area, having been introduced in the Scandinavian countries and the Netherlands. Austria should also consider the introduction of a CO<sub>2</sub> tax, which would make the achievement of the intended emission reductions less costly. Insofar as competitiveness considerations complicate the implementation of a CO<sub>2</sub> tax, a cap-and-

26. Another (non necessarily cost-efficient) solution is the implementation of new technologies as in the case of Vienna's bus fleet, which consists of nearly 80 per cent LPG (Liquid Petroleum Gas) driven buses, of which 94 per cent are equipped with three-ways catalytic converters. (Central European Initiative, 1999, Towards Sustainable Transport in the CEI Countries, Vienna.). More generally, the high share of LPG-buses may be explained by the tax-exemption from the mineral oil tax when used for public transportation.

27. See OECD (2001*b*) and O'Brien *et al* (2001), *op. cit.* for a more detailed discussion.

28. Other forms of international transport, such as air and sea transport, pay no fuel tax -- in accordance with international treaties -- implying incentives that are poorly aligned with externalities.

trade system or tax credits could be introduced to equalise marginal abatement costs.<sup>29</sup> Tax credits can mitigate the impact of environmental taxation on rates of return on invested capital. In the Swedish system of NO<sub>x</sub> tax credits, applicable to stationary users such as large industrial energy users and power generators, which has a charge on the actual emission, the associated revenue is distributed among the polluters according to the share of energy produced. This ensures net benefits to producers with emissions below the industry average and conversely net costs to those with high emissions. The advantage of this system is that it keeps the incentives at the margin and at the same time avoids a sudden deterioration of profit rates. Alternatively, a cap-and-trade system sets the quantity of allowed emissions and allows for trading afterwards to minimise associated abatement costs. The introduction of such a system with possible grandfathering of permits -- i.e. the allocation of permits is related to past emissions -- would allow for more equalised abatement costs as well as preserve marginal incentives to abate unlike the current energy tax's upper limit for tax payments. However, both tax credits and cap-and-trade systems are best applicable to large stationary sources of emissions. Mobile sources of some emissions, such as NO<sub>x</sub>, are difficult to monitor and measure, making for example catalytic converters the only effective way to reduce NO<sub>x</sub> from such sources. Hence, a cost-effective policy to reduce emissions should rely on a general CO<sub>2</sub> tax, but should be combined with regulation to limit some other difficult to measure emissions.

18. The relatively low CO<sub>2</sub> intensity in Austria indicates that reducing emissions may be possible only at relatively high costs. Therefore the implementation of a CO<sub>2</sub> tax seems particularly worthwhile on efficiency grounds. Indeed, a proposal for such a tax has been evaluated and the results are promising in the sense that environmental objectives could be achieved without disrupting the economy. A macroeconomic evaluation of the tax proposal includes simulations with a lowering of payroll taxes and a time-limited grandfathered tax rebate for energy-intensive sectors as well as subsidies to promote energy efficiency.<sup>30,31</sup> The study suggests that due to the technological reaction of industry -- shifting to less CO<sub>2</sub> intensive production methods -- the CO<sub>2</sub> emission reductions would be sufficiently large to meet the government's objective and with only limited overall disruption to economic activity. However, the outputs of export-orientated sectors would decline as they are relatively capital-intensive and will not benefit much from the lower payroll taxes in terms of competitiveness.

### ***Command and control***

19. Environmental regulation plays a central role for vehicles and heating plants. Both standards and control intervals are specified and the recycling of vehicles is regulated. In the case of reducing NO<sub>x</sub> emissions regulation is combined with an economic instrument in the form of a higher mineral oil tax. Given the relatively generous conditions for road transport in Austria with relatively low fuel prices and little use of road pricing, it is not surprising that increasing traffic, especially transit traffic, is becoming an environmental problem. Road traffic is a relatively large emitter of CO<sub>2</sub> and it is therefore important to balance policies so as to minimise the associated economic costs. The following section exclusively focuses on mobile emitters, which is not reflecting a valuation of relative importance, but should only serve to outline the principles of the Austrian approach as well as areas where cost-efficiency of policies could be further improved.

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29. O'Brien and Vourc'h (2001).

30. Koepl *et al* (1996).

31. In many proposals for energy taxes a recycling of tax revenues is suggested to migrate the negative effects. The two most prominent candidates in the debate are either a lowering of labour taxes, which typically benefits labour intensive domestically orientated service sectors, or compensation of (capital-intensive) export orientated sectors. See for example Breuss and Steininger (1998).

*Transport and transit traffic*

20. The objectives of Austrian transport policy are to promote environmentally-friendly traffic that fulfils the needs of the economy, taking into account that Austria is a crossroads in Central Europe. In practice this translates into policies aiming at expanding public transportation and transport infrastructures (see below) and, at the same time, minimising the environmental damages resulting from goods (in particular transit) traffic by greater use of rail and waterway transport modes (partly through the promotion of inter-modal co-operation) and regulatory restrictions.<sup>32</sup>

21. The lower reliance on road transport -- as compared with other European countries -- makes the modal composition of domestic *freight transport* relatively environmentally friendly with 44 per cent of total tonne kilometre transported by road, 27 per cent by rail, 4 per cent by inland waterways, and 25 per cent by pipeline. One of the environmental problems with freight transport is imported through the transit of goods in the alpine region, concentrating emissions and noise pollution in sensitive and geographically restricted environments.<sup>33</sup> Measures to restrict transit transportation have until now relied primarily on quantitative restrictions. Future policies to restrict transit traffic within the context of a liberalised EU transport market and a projected sharp increase of east-west transit after EU enlargement would have to rely more on economic instruments, such as road pricing (see Box 2). Also emissions from other areas of international transport should be subjected to economic instruments to align incentives with externalities.<sup>34</sup>

#### Box 2. Transit traffic

As part of the EU accession negotiations the "Transit Agreement" -- concluded in 1992 -- was integrated into the 1994 Treaty of Accession. The agreement regulates overall transit traffic through Austria (as opposed to the EU principle of free flow of transport within the Union) via the so-called eco-point system. The core of the system is that transit journeys through Austria require a number of eco-points -- equivalents to the NO<sub>x</sub> emission in grams per kWh of the truck. The issuance of eco-points to individual companies is the responsibility of individual countries and mostly based on the grandfathering principle -- allocating permits proportionately to the volume of past transits. The determination of the overall level of eco-point issuance per year is set to gradually achieve a reduction of NO<sub>x</sub> emission of 60 per cent between 1992 and 2003. The agreement has been extended until the end of 2003. After the termination of the agreement, transit traffic through Austria will be fully liberalised.

In one sense the transit agreement has been successful, as the number of eco-points issued has never been fully utilised and NO<sub>x</sub> emissions have been reduced by 50 per cent. Nevertheless, transit traffic has continued to increase in the alpine region. This partly reflects regulatory changes in other alpine countries. However, the use of eco-points has become more concentrated on the alpine transit routes and larger numbers of low-weight trucks (exempted from the eco-point requirement) are being used for transit purposes. In addition, a large part of the transit traffic uses the parallel European Conference of Ministers of Transport (ECMT) permits, which are not subjected to eco-points.<sup>1</sup> The non-tradable ECMT permits provide for multiple entry and multinational transits and were originally issued to facilitate international

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32. As a result, the real gross investment in road structures has fallen by 40 per cent over the decade leading to 1997 compared with a 20 per cent increase in railway structures. This, however, has failed to make an impact on passenger transport's road market share of 90 per cent, while for goods the road market share has increased from just above half to nearly two-thirds. Puwein (1999).
33. While not being the main cause, low fuel prices are certainly not contributing to a reduction of transit traffic. It should also be mentioned that Austria has a positive balance of international transport services.
34. The Federal Ministry of Transport, Innovation and Technology funds a number of research projects in cleaner mobility technologies as an additional measure to diminish the negative environmental impact from transport.

trade and more recently to ease market integration for new members of ECMT (primarily non-EU countries). The issuance of ECMT permits are designed to stabilise the environmental impact with the number of permits increasing as road hauliers introduce more environmentally friendly vehicles.

The non-economic distribution of eco-points and the absence of a secondary market have prevented a move towards greater use of the cleanest technology available for transit purposes.<sup>2</sup> With eco-points effectively being rewarded through the grandfathering principle, carriers with relatively old and high emitting trucks have been faced with limited restrictions and disincentives to continue operations, particular in the absence of a secondary market for permits.<sup>3</sup> Indeed, if only the newest and cleanest truck technology would have been used in 1996, a 40 per cent reduction in NO<sub>x</sub> emissions relative to the base year would have been achieved, equal to about two-third of the targeted reduction. Furthermore, end-of-season shortages of eco-points have enabled some carriers to increase transport prices and thus obtain a private rent on the back of the environmental regulation.

The forthcoming termination of the eco-point system and the failure to reduce traffic in the alpine region requires an alternative system to regulate transit traffic in accordance with EU regulation. The latter implies that the reliance on quantitative restrictions, such as the size of trucks or number of transits, must be abandoned, while bans on night driving for noisy trucks and special speed limits for trucks and buses may be maintained.<sup>4</sup> Thus the eco-point system should be replaced by an expansion of existing road pricing schemes to reflect the cost of transit, including environmental costs.<sup>5</sup> However, current EU regulation does not allow for the inclusion of the latter, although a recent white paper [European Transport Policy for 2010: Time to Decide, COM(2001)370] argues in favour of including all external costs in the determination of road charges. Existing road pricing schemes are per transit based and not directly related to the emissions involved. In the future, a new road-pricing scheme could be based on length of transits, specific routes as well as NO<sub>x</sub> emissions to take into account local environmental costs -- the latter requiring an amendment of the relevant EC directive. The tracking of vehicles and the actual emission could be based on the eco-point system's administrative framework.

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1. Puwein (1998).
  2. The introduction of tradable emission certificates was proposed by Kerschner and Binder (1998).
  3. By 1996, the emission from the most polluting carriers (calculated as the average number of eco-points required from carriers from different nationalities) was around 60 per cent higher than the average off all carriers.
  4. Electronic speed limitation was introduced in 1995 onwards with a maximum speed limit for trucks (over 12 tons) of 85 km/h and buses (over 10 tons) of 100 km/h.
  5. Since the mid-1990s the Brenner motorway charge has increased from €36 to €76 for trucks conforming to minimum noise and emission standards, while other trucks and night runs are charged, respectively, €101 and €151. Over the same period annual road use fees have been cut to about a third of their mid-1995 level.

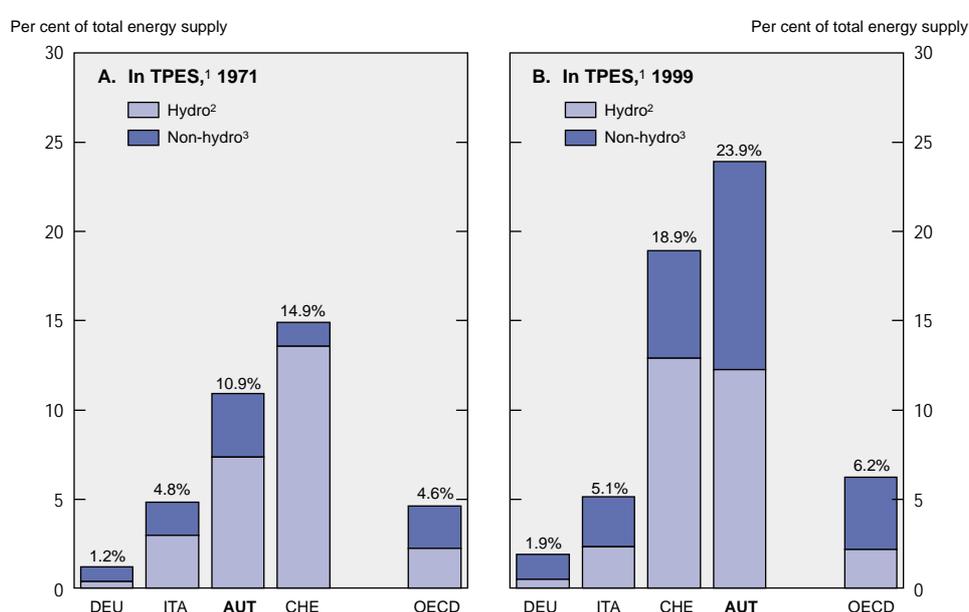
### *Subsidies*

22. The Austrian environmental policy relies more on subsidies and regulatory measures, replacing the role of missing monetary incentives, whereby the non-achievement of an objective is not penalised, but remuneration is offered -- in the form of subsidies -- to reach a particular objective. In this respect subsidies are often re-directed towards activities with an assumed environmental effect rather than directly on environmental outcomes. The following section provides examples from promotion of biomass and other renewable energy sources, public transport, transport infrastructures, and housing for this approach. In general, subsidies are particularly problematic because of their expenditure increasing consequences and are often poorly targeted.

### Biomass and other renewable energy sources

23. A distinctive feature of the Austrian energy supply is a relatively high reliance on renewable energy sources, which is largely explained by the high share of hydropower in the generation of electricity (Figure 4). About two-thirds of potential hydropower capacity have been developed, but further developments are faced with considerable environmentally motivated opposition. With respect to river uses, the Austrian public seems to be more concerned about local environmental goods, like river habitats, and less about the potential benefits of expanding hydropower to affect global warming issues.<sup>35</sup> Despite Austria's ambitious Kyoto target no efforts are being made to improve the acceptability of further exploiting the local comparative advantages for utilising large hydropower plants. Non-hydro renewable energy sources account for about 1 per cent of the electricity supply and comprises mainly biomass energy and to a lesser degree solar and wind power and heat pumps. In addition, non-hydro renewable energy sources play an important role in the supply of thermal energy.

Figure 4. Renewable energy shares



1. Total Primary Energy Supply (TPES) is made up of indigenous production + imports - exports - international marine bunkers +/- stock changes.
  2. Hydro shows the energy content of the electricity produced in hydro power plants. Hydro output excludes output from pumped storage plants.
  3. Includes combustible renewable and waste (solid biomass and animal products, gas/liquids from biomass, industrial and municipal waste), geothermal, solar, tide and heat pumps.
- Source: IEA, *Energy Balances of OECD Countries*, 2001.

35. Calculations, using the so-called "willingness-to-pay" method, suggest that the internal rate of return of establishing a national park east of Vienna ("Donau-Auen" national park) was similar or higher than constructing a hydroelectric power plant in the same place. See Kosz (1996).

24. Despite technological progress, the average production cost of biomass energy is still close to half again higher than that of conventional power stations. Hence, the expansion of biomass as an energy source has taken place on the back of public subsidies which in 2000 covered about one-quarter of the total investment of nearly about €18 million.<sup>36</sup> (Table 2). However, with the forthcoming liberalisation of energy markets in Austria, new instruments to increase the share of renewable energy sources are being introduced.

Table 2. **Environmentally related subsidies in thousand euro by category, 2000**

Category	No. of projects	Support	Investment	Support share <sup>1</sup> (per cent)
Solar energy	162	1 234	4 321	28.5
Wind energy	7	2 206	33 955	6.4
Biomass – district heating	267	5 108	17 642	28.9
Biogas plant	4	178	739	24.0
Small hydro power stations	39	2 585	10 527	24.5
Heat pump, reclaiming of heat	12	189	668	28.3
Central Heating Plants	8	308	1 099	28.0
Switch to District Heating	73	476	1 746	27.2
Thermal renovation of buildings	37	1 778	6 793	26.1
Energy saving investments of entities	7	366	1 435	25.4
Biomass central heating systems	10	6 194	35 233	17.5
Photovoltaik plants	5	36	120	30.3
Climate relevant investments for reduction of air emissions	2	5 890	48 703	12.0
Biomass rehabilitation investments	27	527	2 341	22.5
Sum of energy		27 075	165 323	
EMAS system campaign	54	893	3 153	28.3
Foundry campaign	1	282	942	29.9
Halon campaign	3	60	301	20.0
Lacquer plant campaign	1	21	103	20.0
Reduction of waste	1	201	573	34.9
Reduction of air pollutants	6	983	7 913	12.4
Total sum		29 515	178 307	

1. Support as a percentage of investment.  
Source: Austrian Government.

25. Electricity and gas markets are being deregulated in line with relevant EC directives. The electricity market was fully opened to competition by autumn 2001 (see Chapter III for a detailed discussion). Currently, the overall electricity supply includes 7½ per cent from small hydropower generators and 1 per cent from generators using other renewable energy sources, mainly biomass. These shares are scheduled to increase to 8 per cent for small hydropower generators by October 2001 (with a capacity of less than 10 MW per year) and in steps to 4 per cent for non-hydro renewable energy sources by 2007. The capacity constraint for small hydropower generators is based on an EU established norm. Keeping in mind the economies of scale in hydropower stations it is not clear why small hydropower stations should be less environmentally damaging than big ones. The share for other renewable energy sources is to be increased to 4 per cent. They include wind power, biogas (mostly from waste dumps), biomass, solar power, and geothermal power. These targets are applicable to each *Land* -- limiting the possible exploitation of comparative advantages -- although the composition of non-hydropower renewable energy resources is left to the discretion of the individual *Land* to allow for a flexible implementation of

36. The similar rate of subsidies across renewable energy projects, however, may have very different effects on production costs, depending on depreciation rates and shares of capital cost of total costs.

targets. They will be reached by imposing obligations on suppliers to expand the supply from small hydropower plants and on grid operators to purchase electricity generated by non-hydro renewable energy sources, at guaranteed minimum feed-in-tariffs (determined by the *Land*).<sup>37</sup> The regional distributors -- who pay the (above market rates) guaranteed feed-in-tariffs -- are allowed to recover their costs through an extra grid-charge applicable to all customers (Table 3).<sup>38</sup> To enhance a flexible implementation of small hydropower plants, a system of "green certificates" for electricity generated by such plants will be introduced, whereby grid operators with a production exceeding the target share can sell the surplus of renewable energy to other operators in the form of "green certificates".<sup>39</sup> In case the stipulated targets are not met, the grid operators must pay a compensation fee into a fund set up to promote electricity generation by renewable energy sources. However, given that the electricity supply from small hydropower plants is close to its target, the new support system would appear to mostly preserve their share of electricity production. In addition, the federal law stipulates that *Länder* can impose on grid companies the purchase of electricity from Combined Heat and Power (CHP) plants with a minimum payment per kWh as long as the CHP plant also serves the public district heating system, although no numerical targets are in place.<sup>40</sup> The implicit values of reducing CO<sub>2</sub> emissions through the guaranteed feed-in-tariffs differ across technologies and between *Länder* as well as being at variance with the implied value used in other policy fields. The values attached to CO<sub>2</sub> reduction are at least about twice the estimated value of CO<sub>2</sub> for trading under the Kyoto Protocol as estimated by the OECD.<sup>41</sup>

26. While a certain degree of flexibility has been introduced into the system to promote renewable energy sources through individual (*Länder* specific) implementation and green certificate trading, setting targets for renewable energy has an inherently arbitrary element, reflecting the lack of cost-benefit analysis. In addition, the targets are only indirectly related to the environment and with no built in incentives to achieve an equalisation of CO<sub>2</sub> abatement costs. Similar reductions of CO<sub>2</sub> emissions might be obtained in other and potentially cheaper ways, such as replacing the coal powered plants by a less CO<sub>2</sub> intensive energy source. Moreover, the restriction of "green certificate" trading to electricity generated by small-scale hydropower plants does not fully exploit the possible flexibility in such schemes. It should at least be considered to include electricity generated by all forms of renewable energy and preferably to international trading keeping in mind the global focus on CO<sub>2</sub> emission reduction.

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37. In addition the federal government is providing subsidies for the construction of power plants using non-hydro renewable energy sources, amounting to €16.9 million in 2000. In addition some *Länder* (Vienna) also provides investment subsidies, reaching up 30 or 50 per cent of construction depending on type of renewable energy.

38. The purchasing obligation, the feed-in-tariffs and the extra grid-charge together form the so-called "3-pillar-system" for promoting electricity generated by renewable energy sources.

39. The green certificates are issued by the supplier along with the sales of the electricity and form the basis for verification. Trading of green certificates are also being introduced in other countries like Denmark and Australia. See OECD (2000*b*) and OECD (2001*c*).

40. Combined heat and power plants together with district heating projects have been promoted by grants amounting to €109 million since 1984, implying an average investment subsidy of 10 per cent. In one *Land* (Steiermark) the subsidy rate for district heating projects based on biomass was until 2000 up to 50 per cent when it was lowered to between 30 and 40 per cent. The subsidy for ordinary district heating projects could, prior to 1993, reach 30 per cent.

41. See OECD (1999*b*).

**Table 3. Survey of guaranteed feed-in-tariffs for electricity generated by renewable energy sources (summer 2001)**

€/1000 kWh <sub>el</sub> netto	Geothermal electricity		Solid or liquid biomass		Biogas		Landfill gas		Sewage gas		Wind		Photovoltaic	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Burgenland	23	94	23	94	23	94	23	94	23	94	23	65	73	145
Carinthia	0	0	52	174	30	94	34	58	34	58	57	97	545	727
Lower Austria	36	124	36	124	73	94	73	94	73	94	36	89	129	129
Upper Austria	39	93	26	168	26	156	26	81	26	62	26	118	559	653
Salzburg	31	83	31	83	31	83	31	83	31	83	31	83	31	83
Styria	44	99	45	135	45	135	45	135	45	135	53	118	363	363
Tyrol	83	83	55	83	69	83	55	55	55	55	83	83	276	276
Vorarlberg	39	111	38	111	39	111	39	111	39	111	39	111	111	111
Vienna	30	124	30	124	36	92	36	92	36	92	36	85	110	110

Source: *Einspeisungen elektrischer Energie aus erneuerbaren Energieträgern in das öffentliche Netz*, E.V.A. (Cerveny, Veigl), 2001.

27. The variation in the *Länder*-determined guaranteed feed-in-tariffs means that the incentive structure to promote renewable energy varies considerably across *Länder* as well as across technologies, favouring different types of technologies at different locations without regard to local circumstances. Indeed, the implementation of technologies best adapted to local circumstances can only be realised in a neutral system of guaranteed feed-in-tariffs as such a system will ensure local specialisation according to comparative advantages. Even if the variation in the guaranteed feed-in-tariffs was to reflect other local environmental concerns, then the 100 per cent difference between the highest and lowest feed-in-tariffs for the most common type of renewable energy -- biomass -- cannot be related to a similar variation in local circumstances. Furthermore, the implicit abatement cost associated with the guaranteed feed-in prices is high. In Lower Austria, the expansion of renewable energy in electricity generation is expected to reduce CO<sub>2</sub> emission by around 55 000 tonnes. The similar amount of emissions allows conventional power plants to produce 60 to 140 GWh (depending on primary fuel and power plant technology). Thus, the implied social abatement costs of promoting biomass energy through guaranteed feed-in tariffs in Lower Austria, measured as the additional cost (the difference between the average feed-in-tariff and the production costs for conventional power plants) range from €58/tonne of CO<sub>2</sub> -- if renewable energy replaces older coal power plants -- to €134/tonne of CO<sub>2</sub> in the case of the most efficient natural gas power plants (Table 4).<sup>42</sup> These estimates do not include public subsidies for the construction of renewable energy power plants. In case the expansion of renewable energy sources is replacing alternative expansions of the electricity supply, probably by modern natural gas power generators, the associated abatement costs appear very high (see the section below concerning thermal efficiency in housing), highlighting the need for cost-benefit analysis in policy selection. Indeed, reserving a share of the electricity supply for biomass generators is rather arbitrary. In addition, financial support to expanding the supply of any type of electricity would in itself lead to higher energy consumption, unless a similar amount of electricity from other (high emission) energy suppliers is effectively withdrawn from the market. In addition, subsidising renewable energy sources suffers from a bureaucratisation of the technology decision process. An alternative and probably more efficient policy would be to introduce a properly modified CO<sub>2</sub> tax, not taking into account other environmental concerns and competitiveness issues in the electricity generating sector, which leaves the choice of renewable energy technology to the market (see Box 3). The system of guaranteed feed-in-prices has a similar effect to that of taxes on electricity prices insofar as associated costs are passed on to the consumer. Thus, replacing them with a CO<sub>2</sub> tax should not lead to resistance from consumers as well as being a more effective policy.

Table 4. **Production costs and feed-in tariffs in Lower Austria**

	Small hydro power plants	Biomass	Biogas	Wind power	Solar power
Production costs €/1 000 kWh	29-102	109	109	73	727
Feed-in tariffs €/1 000 kWh		36-124	73-94	36-89	129
Average		87	87	67	

*Source:* Government of Lower Austria, OECD.

42. Calculated as the implied subsidy (the difference between the average guaranteed feed-in price and the average production cost of conventionally generated electricity) multiplied by the amount of electricity replaced, which would amount to nearly 140 GWh from natural gas power plants and 62 GWh from coal powered plants.

### Box 3. Biomass as a renewable energy source

Austria's substantial forestry resources and the relatively low population density in the alpine regions make biomass a natural main plank in the Austrian strategy for developing non-hydro based renewable energy sources. Biomass is considered CO<sub>2</sub> emission neutral as long as the total amount of biomass used in electricity generation is renewed through new biomass growth. Biomass is a generic term for the extraction of energy from a number of sources, ranging from the incineration of straw to exploitation of methane from municipal waste dumps, although the latter is often referred to as biogas. In the Austrian case, the emphasis is on waste products from the forestry sector. At present, however, the biomass technology is not sufficiently developed to produce energy at costs comparable with conventional power generators. Combined with a consideration of the production of biomass incinerators as an infant industry, this has resulted in substantial subsidisation of biomass energy (see above).

Estimates suggest that for biomass technology to become competitive with conventional power generators through the introduction of CO<sub>2</sub> taxation would require CO<sub>2</sub> tax rates of between €54 to €73 per tonne of CO<sub>2</sub>, implying a tripling or more of the present (implicit) CO<sub>2</sub> tax on energy for power generation (see Table 17).<sup>1</sup> Such energy price increases would probably lead to larger reduction in CO<sub>2</sub> emissions than targeted, both as overall energy demand drops and as demand switches from relatively high carbon content fuels like coal and diesel to relatively less carbon intensive fuels, such as hydropower and natural gas. Moreover, such a CO<sub>2</sub> tax would be at least 50 per cent higher than the estimated price of an internationally traded CO<sub>2</sub> permit.

1. Pichl *et al* (1998).

### Public transport

28. Public transport has, in an international context, a fairly high market share of 20 per cent of all passenger traffic (measured in passenger kilometres), split into 12 per cent for railways and 8 per cent bus transport, enabling road traffic density for passenger transport (relative to available network length and GDP) to remain somewhat below the OECD-Europe average.<sup>43</sup> The perceived beneficial environmental effects of public transport are partly the background -- as described below -- for substantial investment subsidies to expand the services. However, the environmental impact of specific modes of passenger transport is a function of the primary source of energy, technology, and the average occupancy rate. Public transportation has a relatively small level of emissions as compared with other modes of transportation. Overall CO<sub>2</sub> emission from public transportation (excluding buses) per passenger kilometre is only 10 per cent of the similar concept for cars as a result of the high reliance on electricity and with the railway system even owning hydro-power plants. Occupancy rates for railways are on average rather low, as a result of the public service obligations of providing public transport outside rush hours and in thinly-populated areas, leading revenues to only cover about half of total costs and with the deficit covered by subsidies from the central government. Promoting environmentally friendly public transportation would appear to rest on two issues:

- The present low CO<sub>2</sub> emission levels for public transportation is largely the result of consumed electricity being generated by the railway sector's own hydropower plants. Thus, insofar as these plants are fully utilised, the expansion of public services will be powered by electricity purchased from a competitive market, where the average CO<sub>2</sub> intensity is higher. Indeed, the use of electricity from its own hydropower plants may in itself -- in the absence of

43. Amounting to one of the highest shares for railways in OECD-Europe. OECD (1998).

price signals in the planning process -- lead to a misallocation of electricity, both internally in the railway sector and externally by pre-empting other energy users.

- Increasing rail capacities may not necessarily reduce traffic volumes in other modes, therefore policies should focus first on securing higher occupancy rates, which would appear to depend on making existing public transportation more attractive for users.

29. Evaluation of current policies in terms of environmental impact is difficult, as no comprehensive statistics of CO<sub>2</sub> emissions for individual public transportation modes are available.<sup>44</sup> The absence of proper cost and price signals makes it is next to impossible to optimise the demand and supply of public transportation with respect to the environment. Local bus transport is exempted from mineral oil tax, implying that the implicit value of emissions set by the government does not enter as a parameter in the provision of public transportation. Moreover, ticket prices are set independently of actual transport costs. Consequently, abatement costs in public transportation are largely unknown, implying that such considerations do not enter planning decisions. Thus, there is room for manoeuvre to further limiting the environmental impact of public transportation simply by improving the planning of public transportation through improving data collection and enhancing the information content in prices by removing tax exemptions and subsidies. However, a fully competitive market for public transportation, including privatisation of public providers, combined with a CO<sub>2</sub> tax would more effectively promote environmental objectives. Public service obligations could be subjected to public tenders (including environmental objectives), thereby introducing a wider choice of technologies. Social concerns should be dealt with by direct means tested benefits to those who are affected by full-cost pricing of transport services, but not by subsidising the service itself.

### *Transport infrastructures*

30. The Austrian infrastructure is well developed, and road network and railway densities are comparable to most other European countries. In order to reduce the negative environmental effects from the north-south transport patterns, one of the main planks in the Austrian transport policy has been to promote a shift of goods and passenger transport from roads to railways, involving a substantial investment programme in the railway infrastructure. The government has increased available financial resources and reallocation of resources from other infrastructure programmes to finance this expansion. Since 1990, about €6.5-7.3 billion has been committed to expand railway services (particularly long-distance) and mainly channelled into investments. Apart from environmental considerations, such an expansion was believed to enable a reduction of operating losses, at the time running at around one third of operating costs (excluding imputed interest). Nevertheless the railway system continues to rely on government subsidies (Table 5). As infrastructure investments in the road network were scaled back at the same time the overall thrust of investment was largely concentrated towards railways, despite this sector's shrinking market share of passenger and goods transport. Looking into the future, closer economic integration with the EU accession states (further accelerated in case of an EU-enlargement) point to the need for a further development of road, and to a smaller degree, railway connections to the east.<sup>45</sup>

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44. Nevertheless, the expansion of public transportation in Vienna is expected to reduce CO<sub>2</sub> emissions by nearly 300 000 tonnes by 2010.

45. Estimations point to a quadrupling or more of goods related road traffic with the prospective EU-member countries in eastern Europe within 10 years after their eventual accession to the EU, while the similar increase for railway transport would amount to a doubling. See Puwein (2001).

Table 5. Public infrastructure investments

	Million euro					
	1992	1993	1994	1995	1996	1997
Railways	1 315	1 459	1 207	922	892	1 074
Roads	1 031	1 042	1 102	985	988	

Source: Bundesministerium für Umwelt, Jugend und Familie (1999), Beschäftigungseffekte umweltrelevanter Verkehrsinvestitionen, Wien.

31. An expansion of railway infrastructure (mainly by expanding capacity on existing routes) might increase the use of railways and improve cost coverage as the result of network effects similar to those seen in air transport. Part of the railway infrastructure expansion is intended to replace road transport of goods through the alpine regions. An expansion of container terminals could help improving the interaction with other transport modes, although requiring that corresponding investments are undertaken in neighbouring countries. A connected issue is the low and seasonally fluctuating capacity utilisation on parts of the railway infrastructures. The more recent trend to close rarely used tracks with low capacity utilisation should also be welcome from an environmental point of view. Like in other cases, a more comprehensive application of cost-benefit analysis could contribute to a more cost-effective use of available funds to expand transport infrastructures.

#### *Improving the thermal efficiency of the housing stock*

32. The strategy to improve the *thermal efficiency* of the housing stock is pursued through stricter building standards for new construction of buildings and subsidies for thermal efficiency investment and for the expansion of district heating systems. All *Länder* offer subsidies to improve thermal efficiency of the existing housing stock with the federal government funding the various programmes, within a total housing subsidy programme of €2.5 billion.<sup>46</sup> The subsidies are designed by each *Land* and take the form of cash subsidies (either as a fixed payment or as a share of renovation costs) or as loan support and are granted according to various criteria, although a common overall objective is CO<sub>2</sub> emission reduction. In one of the *Länder* (Vienna), the total expected amount of subsidies for improving the thermal efficiency of the housing stock is expected to amount to €36 million per year, leading to a projected reduction of CO<sub>2</sub> emissions of 15-20 000 tons per year.<sup>47</sup> Assuming depreciation rates of 1 to 3 per cent, the public cost of reducing CO<sub>2</sub> emissions amounts to -- according to Secretariat estimations -- between €80 to €102 per tonne of CO<sub>2</sub> within a 30-year time horizon.<sup>48</sup> Further studies are needed to identify the appropriate policy mix between setting building standards, subsidisation of thermal insulation investments, and a relaxation of rent controls (allowing landlords to recover the investment costs necessary to improve thermal insulation) in combination with the introduction of a CO<sub>2</sub> tax.

33. As part of the strategy to reduce CO<sub>2</sub> emissions from housing, *district heating* and *combined heat and power (CHP) plants* are being promoted, providing heating for more than 10 per cent of the housing

46. Since 1980 minimum standards for thermal insulation in new buildings have progressively become more stringent. Mandatory efficiency standards are in place for thermal insulation of buildings; efficiency of space heating and hot water equipment; individual metering of heat together with efficiency labels for household appliances.

47. The individual subsidy may range from €29 to €58 per m<sup>2</sup>, but is limited to one-third of the overall project costs. The tenant or the dwelling owner must finance the remaining project costs.

48. Effectively these estimates are biased downwards as the discount factor for future CO<sub>2</sub> reductions have implicitly been set at zero.

stock and almost half of public buildings.<sup>49</sup> The fairly high connection rate to district heating systems has been stimulated by financial support provided by the federal government and by the *Länder* (in some cases requiring new houses to be connected) in the form of direct investment support and grants to allow free grid connection for customers.<sup>50</sup> The small-scale district heating systems powered by biomass have been promoted by setting subsidies so that individual heating bills will be no higher than in the case of oil-fired systems.<sup>51</sup> Moreover, heating is cross-subsidised by electricity in the CHPs as the assured minimum price for electricity is sufficient to cover costs, allowing the setting of heating prices below full costs.<sup>52</sup> In addition, there is little effective energy taxation of heating from CHPs. Thus, the combination of free grid connection and low and non-taxed heating expenses has been instrumental in expanding the district heating network, even possibly beyond its optimum.

### Agriculture and the environment

34. *Agriculture* in Austria is based on a large number of small family owned-farms and with a strong reliance on organic farming.<sup>53</sup> As a consequence Austria has avoided many of the environmental problems often associated with modern large-scale farming, typically in terms of ground and surface water pollution, and functions together with the forestry sector as an important sink of CO<sub>2</sub>. On the other hand, maintaining traditional farming in Austria has required government payments (amounting to some €½ billion) under the Austrian Environmental Programme (ÖPUL) in line with the European Common Agriculture Policy.<sup>54,55</sup> The predominance on small farms can be seen in connection with perceived external effects as the structure of agriculture is considered important for providing a suitable landscape to attract tourism. Notwithstanding the positive environmental impact of ÖPUL, which is largely brought about by a high participation rate, it could possibly be improved by directly aiming at environmental outcomes (See Box 4).

35. Public financial support to promote organic farming are provided to about 8½ per cent of all farms, more than in any other EU country and are on average nearly 20 per cent higher than for conventional farms.<sup>56</sup> Organic farming's crop yield is on average a 20-30 per cent lower than compared with conventional farms, while organic animal production has roughly the same yield as standard animal production and accounts for a larger share (roughly 15 per cent) of overall production of sheep, cattle and dairy cows. On average income per family worker on organic farms is about 15 per cent higher than on

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49. In terms of energy use, however, the plants still rely on relatively CO<sub>2</sub> intensive fuels with nearly half of the plants using oil as compared with almost a third using natural gas, while the remaining plants are powered by biomass or waste incineration
50. The efficiency of district heating is a function of housing density and number of power stations feeding the network as on average 28 per cent of the heat energy is lost during transportation of the water in the pipelines. Bundesministerium für Umwelt, Jugend und Familie (1998).
51. Under the District Heating Promotion Act, about €52 million were disbursed between 1984 and 1995. The Act terminated in 1993 but funding continued thereafter.
52. IEA (1998).
53. The number of farms receiving support is around 150 000 with an average size of some 14 hectare. The average subsidy is about €3 600 per farm under the ÖPUL and €5 800 per farm in total subsidies.
54. ÖPUL is the abbreviation for "Österreichisches Programm zur Förderung einer umweltgerechten, extensiven und den natürlichen Lebensraum schützenden Landwirtschaft".
55. In addition, national law regulates -- through norms and standards -- water protection, nature conservation, and the use of pesticides and fertilisers. The latter was taxed in the period 1986-95 with a consequent 10 per cent decrease in demand, but was abolished upon EU accession.
56. For an exposé of the interaction between organic farming and sustainable development, see for example Stagl (2001).

conventional farms, inducing an expansion of organic farming. Indeed, the supply of organic milk has been promoted to such an extent that it outstrips demand, which has led dairies to sell the excess supply as standard milk products. Normally, excess supply situations are related to prices above market clearing levels, but a particular issue for organic foodstuffs is branding and marketing to enable consumers to distinguish organic products from ordinary food. The information content in existing eco-labels, however, is limited by the multiple eco-labels in use (promoted by associations of organic farmers, direct marketing associations, bio campaigns and individual retail chains with their own eco-labels). As consumers have difficulties in verifying the contents and origins of organic food products, there would appear to be a case for a central standardisation of eco-labels. In addition, the government is actively promoting the production of organic products at the same time as the current excess supply of some organic food products might indicate that the market for expensive high quality organic food has been saturated. The government should thus concentrate on securing framework conditions.

#### Box 4. Austrian agriculture and support

The agricultural programmes to support environmentally sustainable agricultural developments in Austria have been grouped together in the ÖPUL (established in 1995 in connection with the EU accession and renewed in 2000). The aim is to have a broadly based policy encompassing all of Austria (combined with some area specific measures) to protect the environment above prescribed minimum standards and has been instrumental in ensuring that average agricultural incomes have not declined following EU accession. Individual farmers are allowed to choose and combine any of the 34 different individual measures -- mostly directed at production methods -- independently of the farm's location, with the most popular measures favouring extensive farming (through premiums for reducing the use of fertilisers or reducing land use).<sup>1</sup> Nearly three-quarters of all farms participate in the programme, covering about 90 per cent of the agricultural area.<sup>2</sup> More than two-thirds of all farms are run on a part-time basis, with any landowner of more than ½ hectare land being able to participate in the agri-environmental programme if a set of conditions is fulfilled.

The environmental benefits of the extensive farming methods in Austria can be measured in an internationally low average nitrogen balance of only 29 kg/ha compared with eight times higher levels in the Netherlands, a country with particularly intensive farming. Moreover, the high share of organic farming means that the use of commercial fertilisers is well below the average in the EU and that the general use of pesticides has been reduced -- and other active ingredients stabilised -- since the programme was introduced. However, the reported low average values reflect large regional variations. Using the broadly based and production method orientated ÖPUL to solve what are basically local problems runs the risk of inadequate targeting and strengthening local considerations might improve cost-effectiveness. An alternative way to solve such problems would be to directly link the policy instrument to the environmental objective, for example by taxation of nutrient surpluses (as in the Netherlands), which requires establishment of farm level nutrient accounts in the affected areas to calculate the nutrient discharge to surface or groundwater.

The distribution of financial support is mostly related to different production methods and takes into account specific environmental objectives only indirectly. Consequently, the ÖPUL serves to maintain particular agricultural technologies, which does not promote new or existing methods that may have a better impact on the environment.

1. Sinabell (2001).

2. The EU sponsored "SERIEE" project strives to allocate the environment relevant payments to agriculture, forestry and water management to the various fields of support and indicates for Austria that all support to the sector are directed towards environmental targets, including organic farming. In 1999 ÖPUL was fully integrated into "SERIEE".

36. *Tourism* in Austria has a rather uneven regional distribution with the industry playing a particularly important role in the alpine regions. The environmental problems involved arise from the predominant use of cars to reach tourist areas with associated noise and air pollution, while at the local level environmental problems are mostly related to infrastructure investments in hotels, ski-lifts and slopes and high water consumption for tourism purposes.<sup>57,58</sup> On the other hand, management of the land also contributes to reducing and limiting the impact of natural disasters, such as avalanches and spring floods. The ÖPUL's emphasis on environmentally friendly agricultural use of land is considered to underpin the maintenance of a suitable alpine landscape. Moreover, farmers are supplying tourist accommodation services (offering almost a third of all private accommodation for tourists, which makes up 18 per cent of the total). Particular concerns have been to maintain pastures in high alpine areas and to prevent depopulation of marginal locations, leading to the present system of income support although these payments only to a small extent are directly linked to the services rendered. In a few cases, payments are made from the tourist industry to the local farms for providing tourist related services. Undoubtedly, preserving small scale farming in the alpine region serves to prevent natural disasters as well as providing a landscape backdrop for tourism. To optimise such possible synergies between agriculture and tourism it should be considered to establish a framework that allows for a more systematic use of compensatory payments (from the tourist industry to farmers) for such positive externalities.

### Water management

37. Austria has relatively little water use per capita (Figure 5). Abstraction -- mainly supplied by springs and groundwater sources -- is together with pricing of water and water infrastructures the responsibility of the municipals (accounting for 85 per cent of the water supply). Environmental regulation, though, is the responsibility of the central government, which is also providing capital cost subsidies for water related infrastructure.<sup>59</sup> The largest user of water is the industrial sector, accounting for about two-thirds of total abstraction (the highest share of all OECD countries). The household sector's abstraction share is similar to those in other countries, leaving the agriculture sector with a relatively small share of less than 10 per cent of total water utilisation. The latter reflects a modest need for irrigation water, which is typically abstracted directly by the farmers, requiring only a permit that is usually free of charge. Water for livestock is obtained from public water services at the same rates as households.<sup>60</sup>

38. The structure of *water charges* is determined at the municipal level, allowing a large variation of charge systems among and within the various *Länder* (for example, Styria has 29 different models).<sup>61</sup> The relatively widespread coverage of water meters (mostly in owner-occupied housing) has allowed volumetric charging systems in a number of municipalities. Other charge models are based on the size of the home, number of toilets or on population equivalents. This has led to a considerable variation in water charges per m<sup>3</sup> from €0.36 to €1.82, although the average level is relatively low compared with other OECD countries. The subsidisation of infrastructure investment costs implies that the cost of dimensioning

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57. Among other initiatives to minimise the negative environmental impact of local transport and to promote environmentally friendly tourism, it can be mentioned that pilot studies of car-free tourism in the ski resorts Bad Hofgastein and Werfenweng are being undertaken to develop models for minimising the negative environmental impact of local car transport.

58. About 10 per cent of all slopes have required alteration to the natural drop of the slopes.

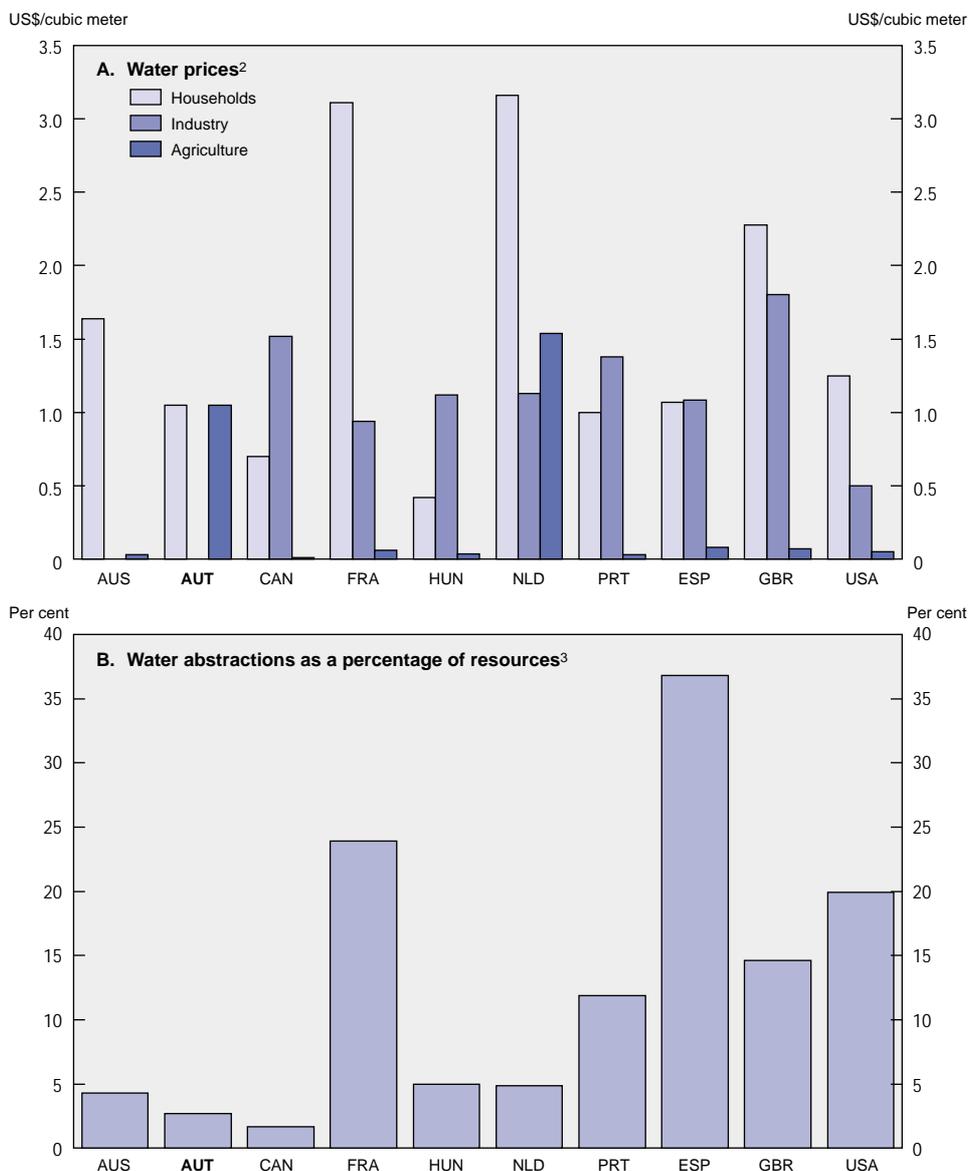
59. The Water Law allows for the formation of local water associations (Wassergenossenschaften, WG and Wasserverbände, WV), when these prove more effective in reaching objectives regarding water. Around one-half of all municipalities is a member of such an association. Rudolph (1998).

60. OECD (1999c).

61. In some regions water suppliers provide financial indemnification for reduced use of fertiliser and pesticides.

the system may not be fully internalised and water service providers with relatively high fixed costs remain on the market.

Figure 5. Water prices and abstractions <sup>1</sup>



1. Data refer to 1997 or latest available year.
  2. Median value for the range of prices for each category.
  3. Total abstraction divided by total renewable resources.
- Source: Environmental database and OECD (2001), *The price of water*.

39. *Wastewater charges* are set by the municipalities and can be based on consumption of fresh water or household sizes, or a lump sum charge. Thus, the variation in the annual costs for an average source is substantial, ranging from €58 to €487 per year. Mainly due to high quality standards, wastewater charges

are relatively high compared with other European countries.<sup>62</sup> Industrial wastewater must undergo in-plant pre-treatment to be of similar standard as household water, otherwise an additional special charge is introduced to reflect the intensity of pollution in industrial wastewater. Alternatively, if the in-plant pre-treatment is sufficiently effective in cleaning the water according to strict environmental standards, the discharge may be returned to the natural habitat (rivers, lakes, etc.) without charges.<sup>63</sup>

40. *Charges related to water and wastewater* are not based on the full cost recovery principle as they only cover somewhat more than half of total costs of water supply and sewage treatment.<sup>64</sup> Investment subsidies from the central government to water infrastructure are fairly widespread, amounting to 20-60 per cent of the investment costs over a 25-year period for wastewater treatment plants and about 20 per cent for drinking water investment.<sup>65</sup> The largest part of these subsidies was used for investment in new sewage systems and sewage treatment plants, partly related to an EU requirement of such water-treatment infrastructures to be available for all communities with more than 2 000 inhabitants by 2005.<sup>66</sup> This has certainly improved water quality although at a possibly higher than necessary cost. The widespread subsidisation and service provision confined to administrative districts also imply that relatively small units have to carry a high burden in meeting high standards for infrastructures, indicating possible resource misallocation. Until recently, the situation was further complicated by a lack of incentives for cost-efficiency. However, in the course of the year 2000, the Austrian government has started an initiative towards higher cost-efficiency by amending the National Water Management Act as well as the corresponding guidelines. Keeping in mind the high priority of clean surface and ground water for the Austrian public the Austrian government aims at securing a sufficient level of water-treatment infrastructure investments. This aim could be furthered via a progressive reduction of capital cost subsidies with a parallel rise in the extent of cost recovery built into pricing. Furthermore benchmarking fees could be introduced in order to improve the cost efficiency of water service management. Water-treatment operators should be encouraged to utilise available economies of scale to increase cost efficiency. One step in this direction could be made by stepping up the opportunities to combine water service providers in more efficient water associations.

## Waste disposal

41. Austrian waste policy has been quite effective in terms of reducing waste deposited in landfills and increasing recycling. Between 1989 and 1996 the fraction of household waste destined for recycling increased from 14 per cent to 50 per cent, and the proportion of waste finally deposited in landfill -- after reprocessing or incineration -- decreased from three-quarters to 43 per cent.<sup>67</sup> This development can be ascribed to a combination of regulations, economic instruments and "voluntary agreements". Regulations

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62. Rudolph (1998).

63. OECD (1999c).

64. Full cost recovery prices to all users should in principle include capital costs, costs of environmental damages and scarcity rent components. The EU Framework Water Directive sets objectives for water protection at the same time as it states explicitly that cross-subsidisation should be avoided, although the directive contains provisions for guaranteeing access to basic volumes for household water at "social" charge rates. Normally marginal cost pricing would be an optimal pricing strategy, but with increasing rate of return such a strategy would lead to continuously under-funded water works.

65. Water-related subsidies are reaching 30 per cent for industries and up to 60 per cent for municipalities.

66. In 1999 about 90 per cent of financial support from the Environmental and Water Management Fund was allocated to investment in wastewater disposal. See Kommunal Kredit (1999).

67. Federal Ministry of Environment, Youth and Family Affairs (1998).

in place for the treatment of household waste concern the packaging and collection of biodegradable waste, among others, while the most important industry regulation is the obligation to take back and treat packaging waste. Waste collection fees are either based on flat rates (per person or per household) or variable rates (related to weight or volume of collected units), and, particularly in the former case, are only to a minor degree designed to create incentives for minimising waste.<sup>68</sup> Moreover, waste collection fees are not particularly based on the full cost recovery principle as total revenues may exceed costs.<sup>69</sup> In addition, a substantial amount of waste separation at the household level is taking place on a voluntary basis.

42. However, recycling quotas must be set in sensible ways to ensure environmentally friendly and efficient waste management, as illustrated by a cost benefit analysis of recycling plastics from household waste, commissioned by the Ministry of Environment.<sup>70</sup> It concludes that the costs of the present system exceed its benefits by a fair margin every year. Moreover, important interdependencies with other environmental policies may not always be recognised, such as with fuel taxation. If the production of a given good has a higher transport intensity than involved in recycling the same good, then low fuel taxation would conflict with the recycling objective.<sup>71</sup> Alternative systems to recycling quotas may be preferred, such as differentiated fees targeted directly at the associated externalities.<sup>72</sup> Indeed, the Austrian experience with increasing landfill charges points in this direction. They are set according to the hazard potential of the waste and on the equipment of the landfill sites, underpinning the development where waste treatment is increasingly moving away from landfills and with the remaining landfill waste increasingly being shifted towards more technologically advanced landfills.

43. In the case of contaminated disused industrial sites, the legal framework stipulates that the responsible company has the financial duty -- with no time limit -- to clean them up. If the responsible company cannot be obliged to do so, the responsibility may fall on the property owner and only otherwise it becomes a federal responsibility.<sup>73</sup> So far only 57 out of 158 registered contaminated sites have undergone complete clean up and another 53 are in the process of being cleaned. Public funding covered nearly 80 per cent of total remediation costs in 1997 before declining to just above 50 per cent in 1999.

## Conclusions and assessment

44. Environmental concerns are deeply embedded in the political debate in Austria and materialise in various aspects of policy setting, including in the formulation of regulations to protect the environment, in the planning of major infrastructure projects, and in the setting of ambitious environmental goals and international commitments. An evaluation of Austrian policies needs to take into account the high environmental standards found in Austria and substantial financial and economic resources are devoted to meet Austria's environmental objectives. However, the lack of a systematic evaluation of policies' environmental impact and thus of an integration of environmental concerns and policy formulation means that targets are set at ambitious levels without consideration of the implied costs and with little possibility for ex-post evaluations. Furthermore, policies directed at similar objectives are not well co-ordinated, as

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68. A 1999 survey revealed that only 8 per cent of the Vienna population were aware of the costs of waste collection.

69. The Fiscal Compensation Law ("Finanzausgleichsgesetz") stipulates that the annual revenue may not exceed 200 per cent of the annual costs.

70. Federal Ministry of Environment, Youth and Family Affairs (1998).

71. ECMT (2000).

72. See Pearce (1998).

73. Since 1989, about €218 million has been earmarked for cleaning up contaminated industrial sites.

witnessed by the CO<sub>2</sub> emission reduction strategy and the implicit high and varying cost associated with the expected CO<sub>2</sub> emission reductions in different policies. Introducing a consistent use of cost-benefit analysis across policies would provide the basis for an integrated policy planning process.<sup>74</sup> Policies could thereby attach similar values to reducing CO<sub>2</sub> and thus serve to reduce overall abatement costs and enhance policy effectiveness and co-ordination across the Austrian federation. In addition, cost-benefit analyses could be used as an efficient feedback and evaluation instrument.

45. Policies to pursue environmental objectives with respect to CO<sub>2</sub> emissions have until now been mostly based on subsidies as well as command-and-control instruments. However, to reach Austria's ambitious environmental objectives in a cost-efficient manner a greater reliance on economic instruments is warranted, like integrating the current system of taxes on energy and fuels with a properly modified CO<sub>2</sub> tax, which would increase incentives for using less CO<sub>2</sub> intensive energy sources. Such a change should be accompanied by the abolition of the various tax exemptions in place at present that are not environmentally motivated so as to ensure similar abatement costs across the economy. In addition, such a measure would remove the current tax advantage of diesel as well as making renewable energy sources more competitive. In the Austrian context, however, a CO<sub>2</sub> tax would generate a rent for large competitive hydropower plants, which cannot be competed away through an expansion of electricity generated by hydropower -- given the restrictions on developing new hydropower plants. Such a CO<sub>2</sub> tax generated rent would then have to be removed through additional taxation. Insofar as it is difficult to implement a CO<sub>2</sub> tax for competitive reasons, alternative schemes mitigating the competitive disadvantage of a CO<sub>2</sub> tax without diminishing environmental incentives could be the introduction of tax credits or the expansion of the green certificate system, emission permit schemes, including cap-and-trade systems with permits being grand-fathered according to past electricity production and based on average industry emissions.<sup>75</sup> Indeed, emission trading would allow participants in the scheme to receive monetary compensation for implementing new and environmentally friendly technologies as the associated reduction in CO<sub>2</sub> emissions can be sold, ensuring that the most intensive emitters would face the strongest incentives and thus ensuring a cost-efficient lowering of CO<sub>2</sub> emissions.<sup>76</sup>

46. Until now, the support system for promoting renewable energies has relied on providing investment subsidies. The higher reliance on market based instruments in the new support system within a liberalised electricity market is most welcome. The deregulation of Austrian energy markets is also beneficial from an environmental point of view, as competitive price structures combined with taxation of polluting emissions, such as CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>x</sub>, would serve to equalise abatement costs across different types of primary energy sources.

47. The promotion of renewable energy sources within a liberalised electricity market without a tax on CO<sub>2</sub> emissions is a non-trivial problem as the technologies have not evolved to a degree where the cost of electricity generated by renewable energy source can compete directly with marginal conventional power plants (with the exception of large-scale hydro power plants). The targets for how large a share of electricity generation originating from renewable energy are somewhat arbitrary and are formulated within the context of specific environmental problems. The cost-ineffectiveness of the guaranteed feed-in-tariffs is revealed by the high and varied implicit values of CO<sub>2</sub> for the various policies across Austria. One of the main advantages of moving from a subsidy based support system for promoting renewable energies to a market based one is that the latter allows for the equalisation of abatement costs across projects, which assures the achievement of an environmental target with the lowest possible economic burden. The

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74. See OECD (2001*d*), Chapter VI on the experiences of OECD countries of cost-benefit analysis using to encourage environmentally sustainable growth.

75. See OECD (1999*d*) for a survey and discussion of existing programmes as well as OECD (2001*e*).

76. See Kletzan and Köppl (2001) for a detailed discussion of the issues involved.

variation in guaranteed feed-in-tariffs is biasing the incentive structure in complex ways. Thus, a uniform structure for feed-in-tariffs across Austria should replace the present system with *Länder*-determined feed-in-tariffs. On the other hand, the possibility of “green certificate” trading allows for a welcome element of flexibility, for example in avoiding unnecessary transmission costs. However, the restriction of “green certificate” trading to only concern electricity generated by small-scale hydropower plants appears overly restrictive, as it is preventing the cost of expanding renewable energy sources from being minimised. An additional consideration should be the dynamic adjustment of minimum feed-in tariffs in line with technological progress in the non-hydro electricity generation to ensure support rates that remain constant in real terms to avoid an excessive expansion of particular types of renewable energy sources.

48. The use of command-and-control instruments has limited the environmental impact of transport -- particularly transit traffic -- but has failed to limit the increase of alpine transit traffic itself. Moreover, the success of moving freight to the railway system by providing infrastructures for promoting co-transportation hinges on other countries engaging in similar investments, postponing the date when such transport solutions can be implemented on a large scale. Thus, the regulation of transit traffic should rely on bringing into line the marginal cost of transit with the associated external costs. This could be obtained through a road pricing system that takes into account the environmental costs of lorries driving through sensitive alpine regions, requiring an adaptation of the pertinent EU legislation. This would improve incentives for hauliers to use only the most modern and effective vehicles in this particular area.

49. Reducing CO<sub>2</sub> emissions through urban renewal projects is a very expensive policy, which might not be justified by other associated benefits. In addition, subsidies to improve the thermal efficiency in housing benefit the owners twice: through a lower energy bill (possibly shared by owner and tenant) and a quality improvement of the property, leading to higher property prices. The latter effect would indicate that a relaxation of rent control regulations would enable landlords to recuperate the investment costs of improving the thermal efficiency. The complementary policy of expanding district heating and combined heat and power plants (CHPs) through large-scale subsidies may have pushed the coverage beyond its efficient limit. In addition, the ongoing liberalisation of the electricity markets implies that the CHPs will be delivering services to a competitive electricity market and a non-competitive heating market. That kind of structures might lead to cross-subsidisation from the non-competitive to the competitive segment. Such competition problems should be solved before further expanding the coverage of CHPs.

50. Within the public debate there is a perception that public *transport* is friendlier to the environment than private cars, leading to a policy objective of better balancing the use of private cars with public transportation. Policies to minimise the environmental impact of passenger transport should focus on bringing the marginal cost of using cars into line with their environmental externalities through appropriate taxation as well as minimising the environmental impact per passenger in public transportation.

51. The considerable reliance on subsidies to promote various environmental objectives should be reconsidered. The relatively high costs of water-treatment provision reflects high standards as well as individual units being rather small and not facing pressures to control costs. A phasing out of capital cost subsidies would allow a move towards full recovery pricing principles, thus revealing particularly inefficient water-treatment providers and improving resource allocation. Pressures to lower costs could include the introduction of a standardised charge structure. In addition, insofar as high costs are the result of inefficiency in size, the formation of cost-reducing associations of water-treatment providers should be exploited further. The setting of waste collection and treatment charges should be determined by the full cost recovery principle -- including environmental costs -- to avoid cross-subsidisation leading to misallocation of resources. In addition, quotas might lead to an inefficient approach to waste collection and treatment as their use risks restraining the implementation of new technologies.

52. Unlike in many other countries, the agricultural sector in Austria is not the origin of general environmental problems. However, resource allocation might be improved if the support system were changed from production-method-oriented to be targeted at specific environmental outcomes. Valuation of the latter can be achieved by cost-benefit analysis. The newly experienced excess supply of some organically-farmed products may be the reflection of a need for a common and unified system of eco-labels, but could also reflect a saturation of the market for high price and high quality organic products. Both arguments highlight that more room should be provided for market determined outcomes while administrative measures should focus on framework conditions. The perceived positive effects of agricultural environmentally friendly use of land on tourism should be evaluated through the introduction of cost-benefit analysis which could form the basis for a framework that allows for a systematic use of compensatory payments for such positive externalities, leading to an optimisation of such synergies. Combined with a redirection of subsidies to be linked directly to the provision of tourism related services and landscape preservation this would improve the targeting of subsidies by directing resources to the areas with the largest scope for tourism. In addition, although there are no general problems of nutrient leakages, local environmental problems arising from agriculture requires local solutions, such as the establishment of farm level nutrient accounts combined with taxation of nutrient surpluses, rather than be solved with broadly based programmes.

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