

# Chapter 1 Environmental vehicle excise duty in Sweden

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## 1 Introduction

An environmental excise duty on cars was introduced in Sweden in 2006. While annual vehicle excise duties in many countries traditionally have been based on weight or engine size, they are in the new system in Sweden directly connected to the environmental performance of the vehicles. Carbon dioxide emission per kilometre is the decisive parameter. The rates are moreover dependent on the fuel type, with lower rates for cars that can use alternative fuels like bio fuel.

The introduction of the environmental vehicle excise duty stems from a pronounced opinion among consumers and policy makers of that the climate impacts from road transport must be radically changed and reduced and, more specifically, that public governance and regulation shall support a more environmentally friendly development in the area.

With the environmental vehicle excise duty, Sweden is among the minority of countries that connects carbon dioxide emissions with taxes on cars. The environmental excise duty has resulted in considerable change in the patterns of consumption of cars. The environmental vehicle duty is an important regulatory element in the attempts to re-orient the development in the mobility area in direction of sustainability.

## 2 Case description

### 2.1 Overview and background

The environmental vehicle excise duty system introduced in Sweden in 2006 basically works like this: The duty is constituted by a basis amount of 360 SKR plus a carbon dioxide component on 15 SKR per gram CO<sub>2</sub> exceeding 100 gram per kilometre. (10 SKR equal around 1.1 Euro.)

This is for ordinary petrol driven passenger cars. For cars using alternative fuels like bio fuel the additional component is only 10 SKR per gram CO<sub>2</sub> per kilometre. For diesel driven cars the amount shall be

multiplied by 3.5. This shall be done in order to compensate for general lower tax on diesel fuel and general lower requirements concerning emissions of particles, NO<sub>x</sub>, etc.

The resulting amount is for example for 1830 SKR for a petrol driven car with the Swedish average emissions on 198 g/km (2003 figure), while it is 660 SKR for a car with relatively low emissions on 120 g/km. Compared to the prices of new passenger cars which often are in the order of 100.000, 200.000 SKR or more, the duty amounts are visible though not extraordinary large. The impact of the new, environmentally based duties must be seen together with the activities connected to it like the establishment of the concept of green cars ('miljöbilar') as described below.

The problem with emission of green house gasses from road transport in Sweden is significant. The weight and power of the passenger cars the consumers buy have increased significantly in the latest decades. Similar developments are seen in other countries, however, the car fleet in Sweden is the heaviest in Europe and the two manufacturers of passenger cars, Saab and Volvo, are targeted at the segment of larger cars (Kågeson 2004). Sweden is a 'car country' with the car manufacturing industry as one of the traditionally strong industries and with low taxes on acquisition of new cars.

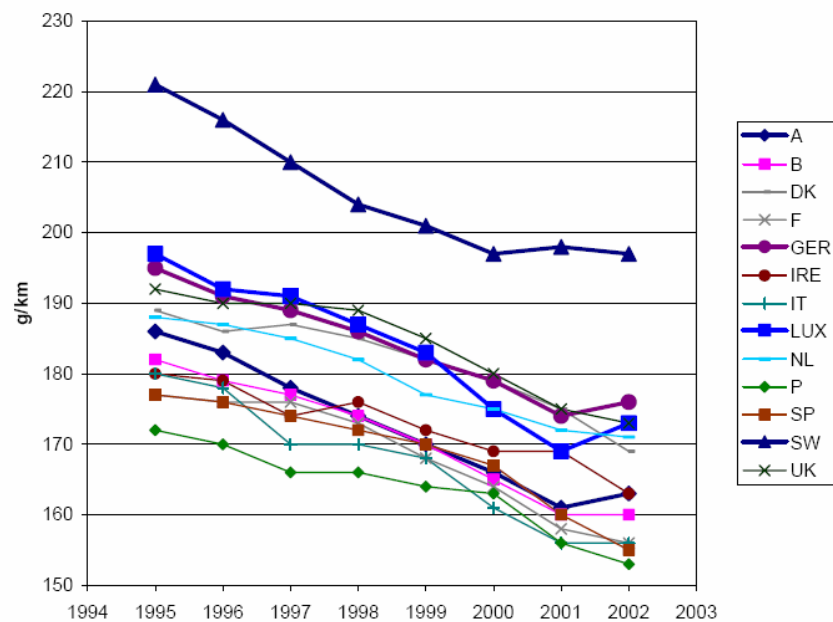


Figure 1: The development in average CO<sub>2</sub> emissions from cars in selected EU countries (Kågeson 2005).

Figure 1 shows the average CO<sub>2</sub> emissions from cars in different EU countries. Emissions from cars in Sweden are considerably higher than other EU countries. For 2003 it was 198 g/km. In this sense, Sweden is 'worst in class' considering CO<sub>2</sub> emissions, as it has been pointed out by observers. The positive tendencies of reduction of emissions in the 1990s stopped by the beginning of the 2000s.

As Figure 2 shows, the share of purchases of larger cars on more than 1700 kg or more than 1500 kg has increased significantly from 8% of the new registrations in 1990 to more than 50% in 2003. Conversely, the share of registrations of small cars less than 1000 or 1300 kg has decreased considerably from 52% in 1990 to around 13% in 2003.

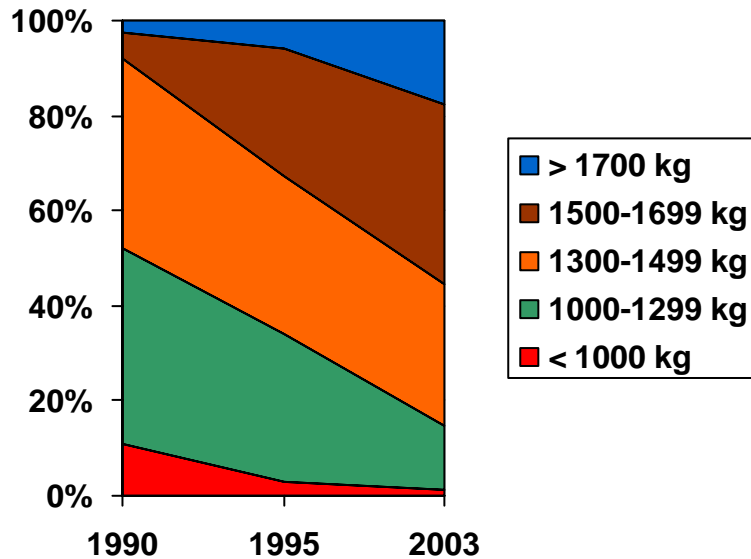


Figure 2: Development in registrations of new passenger cars in Sweden, breakdown by weight (BIL Sweden; Kågeson 2005).

## 2.2 Actors and their roles

### 2.2.1 Primary actors

Many actors have been involved in the development of the environmental vehicle excise duty in Sweden. As a regulatory effort at national level, however, the Swedish Government and the national public authorities play a very central role. The Government has been actively involved in development of the strategy and policy on the issue with the Ministry of Sustainable Development (now the Ministry of Environment) in a leading role. Vägverket, the Swedish Road Administration, is responsible for administration of the vehicle duties and moreover carries out many of the analyses behind the environmental vehicle duties.

With the increasing road traffic and the connected increasing impacts on climate and environment, the Government in 2003 included the road transport sector as a central, critical element in the climate policy and initiated the development of a climate strategy for the road transport sector (Vägverket, 2004). Taxes for more CO<sub>2</sub> efficient vehicles and for a change to new, renewable fuel types are among the instruments pointed out in the

strategy. It is stressed that a radical change both at short sight and long sight is needed.

Overlapping with this strategy, the Government moreover launched a radical policy against the societal dependency on oil and against the existing oil regimes within the energy sector and transport sector (e.g. Dagens Nyheter, Nov 1, 2005). The goal is to create independency of oil within 15 years and reduce the use of oil significantly by 2020. For the road transport the reductions shall be 40-50%. Apart from sustainability and climate issues this policy also concerns aspects like international independency and self-sufficiency, industry policy, agricultural policy and regional policy. A high level commission, including the Prime Minister, 'The Commission Against Oil Dependency' worked on the issue. Renewable energy from biomass and development of fuel efficient cars in the 'Swedish-American' car industry are important elements of the commission's recommendations (Kommissionen mot oljeberoende, 2006).

The successful establishment of the concept of 'green cars' ('miljöbiler') is an aspect that is closely related to the effects of the environmental vehicle duties. Over the latest years, the concept has obtained widespread dissemination. It is now well-known in the general public and a term that is frequently used in mass media, public discussions, and in connection with trading of cars. The concept has become normal and is present in the consciousness of people when discussing cars and road transport.

The official definitions of green cars by the government and national authorities have been changed and updated a couple of times (Vägverket, 2005) and are continuously discussed. Many actors, e.g. local municipalities and representatives of the car industry, consumers and NGOs, have been involved in the discussions of the green car concept and there are examples of local municipalities that make their own definitions in connection to e.g. restricted access to town centers, parking charges, etc. The most recent national definition of a green car is this (Regeringskansliet, 2007):

- Conventional cars: Petrol and diesel cars with carbon dioxide emissions that do not exceed 120 grams/km.
- Alternative fuel cars: Cars that can run on fuels other than petrol or diesel and with fuel consumption that does not exceed 0.92 litre petrol/10 km, 0.84 litre diesel/10 km or 0.97 cubic metre gas/10 km.
- Electric cars: A passenger car meeting environmental class Mk EL standards and with electric energy consumption that does not exceed 3.7 kilowatt hours/10 km.

Though a change of Government took place in 2006, the policy and strategy concerning the climate impacts from road transport is not completely changed. In Spring 2007, the new Government introduced a 10.000 SKR rebate on new green cars and the Minister of Environment expects that there in his coming climate proposition will be suggestions of higher taxes on carbon dioxide, more expensive gasoline and cheaper public transport (Regeringskansliet, 2007, Ekot, 10 March 2007). Already in 2006 a

rebate of 6.000 SKR was introduced for diesel cars with reduced particle emissions (particle filters).

### 2.2.2 *Other actors*

A large number of organizations have been active in the establishment and discussion of the environmental vehicle duties and the definitions of environmental categories of cars. The car manufacturing industry and its' industry organization, BIL Sweden, have participated in much of the discussion and among other things argued for continued emphasis on road transport as an important part of the infrastructure, for alternative fuels, for technical focus on improved cars, and for long planning horizons (BIL Sweden 2006). Also representatives of car distributors, car dealers etc. have contributed.

Environmental organizations and consumer organizations have participated in the discussions. Among consumers of cars and mobility by road, there has been an increasing concern of the pollution from car transport. Many find that on the one hand they need to, or like to, use a car; on the other hand that the climate impacts and other environmental impacts from car transport must be addressed and limited. Green Motorists ('Gröna Bilister') is a consumer organization representing such view points. The organization has been active among other things concerning the definitions of green cars. Apart from measures for reducing the environment impacts, they have for example cared for the prices on the market for used cars and for interim arrangements for older cars (Gröna Bilister, 2005).

A large part of the consumers in Sweden supports the attempts to change the climate impact from road traffic. A survey showed that two thirds the Swedish consumers surely will choose a more environmentally friendly car next time (87% if one includes 'yes, maybe' answers). A similar share is interested in changing their way of driving to a more fuel efficient practice. Moreover, around three fourths of the Swedes find that they can themselves do something in order to stop the greenhouse effect and the climate changes. 71% answer 'yes, absolutely' or 'yes, maybe' to whether they will drive more slowly. Around 50% expect that they will use more public transport in the future and similarly concerning driving car less (Naturvårdsverket, 2006).

Peoples' opinions about these issues have become much clearer and stronger over the latest years. While similar surveys in 2002 and 2003 showed considerable unawareness and had 'don't know' shares of 12-18% of the answers, they are now only on 1-5%. In general, eight out of ten Swedes are interested in paying 5% more for services and products from companies that work for limitation of the greenhouse effect. Moreover, the public in general supports that Sweden reduces its emissions of greenhouse gases more than required by EU. More than 90% of the population have this stance.

The changes in the understandings of the relationship between car consumption and climate are reflected in the media. The media coverage of cars is to a larger extent than earlier dealing with environmental issues and environmental parameters of cars. This is another indication of that climate issues have become on the agenda for the consumers. The green car concept,

in its briefness, has shown to fit well to mass media communication and the media writings about green cars must be considered to have played an important role for the broad dissemination of the concept.

As mentioned, a number of connected activities and efforts have been influential on the impacts of the environmental vehicle excise duty. In addition to the activities mentioned above must also be mentioned regional climate strategies for the road transport sector and the environmentally oriented planning efforts in larger towns like Stockholm, Göteborg and Malmö. These efforts among other things include lower speed limits, restrictions on access and parking for cars with high emissions, and, for some time, congestion charges (in Stockholm). Moreover the towns have played leading roles in the development of information material and news about green cars and transport (e.g. [www.miljofordon.se](http://www.miljofordon.se); [www.miljobilar.stockholm.se](http://www.miljobilar.stockholm.se)).

Voluntary as well as obligatory requirements of environment information to the consumers in connection to car purchase have been established and the public authority on consumption publishes information material on the issue (Konsumentverket 2006). The consumers thus often meet this information at the same time as they considered the environmentally based vehicle excise duties. In addition, information dissemination and knowledge development about consumers' opportunities for more environmentally friendly driving (eco-driving) are made.

The demand for environmentally friendly cars for public institutions and regional, local and national authorities was originally one of the arguments for defining a concept of green cars and public procurement has played an important role in the developments in the area. All these different activities have been part of the near context for the environmental vehicle excise duty and must be remembered when considering the results.

### 3 Results

The environmental vehicle excise duty in Sweden has resulted in a drastic increase in the number of new green cars. The increase from July 2005 to July 2006 is on 390%. Of the new cars purchased in July 2006, 12,8 % were green cars. In July 2005 the figure was only 2,9 %. This means that the share of green cars is more than four-doubled (Klimataktuellt, 2006 and 2007). In April 2007, 14,3 % of the purchased new cars were green cars. The amount of new cars with emissions of less than 120 gram carbon dioxide per kilometer was three times as many in the first quarter of 2007 as in the same period the year before (Dagens PS 0205 2007, Bil Sweden). The environmentally duty system has thus led to considerable changes in the consumers' consumption patterns concerning purchase of car.

With these changes, the numbers of environmentally friendly cars and of cars for alternative fuel in Sweden are clearly much larger than in most other countries, e.g. also than in otherwise comparable countries like Finland, Norway and Denmark. The CO<sub>2</sub> emission from new cars in average is still relatively high but has, compared to the 198 g/km in 2003, improved to 191 g/km (2006 figure).

The consumption of gasoline shows a parallel change, though there is some uncertainty concerning how much of this can be directly connected to the green cars (and not e.g. to the changing oil prices etc.). From mid-2005 to mid-2006 the gasoline consumption in Sweden decreased with 3,6%. Instead, the

consumption of ethanol-fuel and diesel increased. The former multiplied 3 times, but does still in total stand for only a small share of the fuel. The diesel consumption increased with 2,7% (Svenske Petroleumsinstitutet, SPI 2006).

Consumers have become increasingly concerned about and aware of the climate impact from their road transport and car driving over the last couple of years. There is a clear understanding that there is need for further change if the mobility patterns shall be sustainable. The establishment of the concept of green cars has been quite successful. It is a visible subject in the mass media and appears at many homepages and shops of car dealers. At the homepages of the car manufacturers it is also highlighted. The green car classification is often an important element in the sale and purchase of cars. While it in 2003 was 'only' 52% that would choose a more environmentally friendly car, it is 66% in 2006. People are moreover more enthusiastic about eco-driving and about reducing their use of cars (Naturvårdsverket, 2006).

The public procurement through the purchases of green cars by the public authorities has developed significantly. 62% of the authorities meet the requirement of at least 75 % green cars among the new purchases. This is a doubling since 2005. In 2006, the authorities bought 941 green cars. This constitutes 70% of the cars in the categories addressed by the requirements (other 604 vehicles are for different reasons excepted from the requirements) (Klimataktuellt 2007).

The large Swedish produced cars are also popular when it comes to models that can use alternative fuels. The car manufacturers (Saab and Volvo) appear on three of the five first places on the top-five of the most sold ethanol cars in Sweden in 2006. To the car industry, the area green cars appears as one of the most important strategic areas of development.

Table 1: Top five of sold ethanol cars in 2006 in Sweden (Dagens Nyheter 2007).

<b>Car model</b>	<b>Number of cars</b>
<b>1. Saab 9-5</b>	10.941
<b>2. Ford Focus</b>	7.237
<b>3. Volvo V50</b>	5.172
<b>4. Volvo S40</b>	1.452
<b>5. Ford Focus C-Max</b>	1.066

Though some clear, positive tendencies in direction of sustainable mobility, the Swedish environmental vehicle can in some senses only partly be called a success. The car fleet is still heavier and more fuel consuming than in other European countries and there are no clear signs of that cars are used significantly less or significantly more efficiently. Moreover, the total number of new cars registered is increasing some and not decreasing. It has been pointed out that despite the higher emissions, the larger cars with large motors are still supported and enjoys considerable goodwill. The new cars have become more efficient with average consumption decreased from 8,2 liters per 100 km in 2004 to 7,8 in 2006 (EU15 average in 2004 was 6,5 liters per 100 km). But considerably more is needed in order to meet the climate targets and break radically with the current development tendencies in the emissions of greenhouse gasses from road transport.

While there are continued discussions about the environmental advantages of the alternative fuels, the environmental vehicle duties and the related efforts have clearly led to development towards the goal of becoming less dependent on oil.

#### **4 Further learning experience and conclusions**

The results of the environmental vehicle excise duty have appeared on the level of the broad consumer markets. In this sense, the effects of this case are much more far reaching than many small-scale experiments, demonstration projects, etc. A system level perspective is employed, explicitly expressed in the climate strategy for road transport and in the policy against oil dependency. With the ambition of making a radical break with the dominating oil regime in the transport and energy areas (and in society in general) the case is very unusual and ambitious in its goals of system changes. Concerning consumers' consumption patterns, the goal is not an elimination of road transport, but a radical change in the climate impacts, through among other things a significant transformation of the cultural understanding of cars and car transport. In the new understanding environmental performance is a key aspect. The widespread dissemination of the green car concept is central for this.

The case is a multi-actor development in which both consumers and producers of mobility solutions are actively engaged. Policy makers and public authorities are however the types of actors that must be said to have played the most central role. Mass media communication and public discussion have also been very important. The important role of not only consumers and producers *par se*, but of the organisations and associations representing them must be stressed.

The environmental vehicle duty system in Sweden has only been in force about one year. Larger dissemination and larger effects can be expected in the coming years. There seem moreover to be possibilities of further improvement of the system in the future, for example through a continuous assessment of the criteria for the classification of green cars and fuels.

For other countries there seem to be large potentials in learning from the experiences in Sweden and make similar efforts. The efforts in Sweden are however complex and tied to the specific context. They include many complementary activities and not just the basic introduction of a new regulation on vehicle excise duties. If one had introduced the new vehicle duty more or less 'in silence' and without the many connected activities, the results would not have been as significant.

This means that other countries should not simply copy the Swedish environmental excise duties. The considerable emphasis on individual vehicles in the efforts towards sustainable mobility is probably to some extent a result of the traditionally large role of the car industry in Sweden. In other countries the weight might be put differently, for example with more emphasis on taxes on fuel or on integrations of public and private transport.

=====Simple sustainability evaluation sheets=====

<b>Economic/profit aspects Compare with the existing regime/system</b>	
	Score (1 = better, 0 is equal, -1 is worse)
How profitable/ valuable is the solution for the providers? (can be a consortium of companies), including cost of production, cost of capital and market value of the solution for the provider(s)? Is it cheaper to produce than the competing product?	1
How profitable/ valuable is the solution for customers/ consumers? Are there a concrete, tangible savings in time, material use etc. for the customer? Does it provide 'priceless', intangible added value like esteem, experiences, etc. for which the customer is willing to pay highly? (both in comparison to a traditional product system)	1
How difficult to implement and risky is the solution for the providers? Can a promised result be measured and delivered with a high probability, or has the client a high and uncontrollable influence on the costs? When is the return on investment expected?	0
How much does the solution contribute to the ability to sustain value creation in the future? Does it give the consortium that puts the solution on the market now and in the future a crucial and dominant position in the value chain?	1
<b>TOTAL</b>	<b>3</b>
<b>PROFITABLE AND COMPETITIVE?</b>	<b>SCORE</b>

<b>Environmental/planet aspects - Compare with the existing regime/system.</b>	
	Score (1 = better, 0 is equal, -1 is worse)
How good is the solution in terms of Material efficiency (including inputs and outputs/waste)?	1?
How good is the solution in terms of Energy efficiency (energy input and recovery of energy without transportation)?	1
How good is the solution in terms of Toxicity (including input/ output of hazardous substances and emissions without transport)?	1
How good is the solution in terms of transport efficiency (transportation of goods and people including transport distances, transportation means, volume and packaging)?	1
<b>TOTAL</b>	<b>4?</b>
<b>ENVIRONMENTALLY SUSTAINABLE ?</b>	<b>SCORE</b>

<b>Social/people aspects -Compare with existing regime/ system.</b>	
	Score (1 = better, 0 is equal, -1 is worse)
Does the solution contribute to quality of work in the production chain (Environment, Health, Safety; enriching the life of workers by giving learning opportunities, etc.)?	0
Does the solution contribute to the 'enrichment' of life of users (by giving learning opportunities, enabling and promoting action rather than passiveness, etc.)?	1
Does the solution contribute to intra- and inter-generation justice (equal wealth and power distribution between societal groups, North-South, not postponing problems to the next generation, etc.)?	1
How much does the solution contribute to respect of cultural values ad cultural diversity, e.g. customized solutions, contributing to the social well being of communities, regions etc. (cultural values)?	1
<b>TOTAL</b>	<b>3</b>
<b>SOCIAL ISSUES SOLVED ?</b>	<b>SCORE</b>

Source: U.Tischner and A. Tukker (2006), A practical guide for PSS development. In: A. Tukker and U. Tischner (eds., 2006), *New Business for Old Europe. Product Service Development, Competitiveness and Sustainability*. Sheffield, UK: Greenleaf Publishing

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