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IMPACT OF THE ECONOMIC ASPECTS ON IMPROVING THE QUALITY OF THE ENVIRONMENT

ABSTRACT:
Nowadays in environmental field, it is necessary to concern about the relation between economical expenses and technical level of actions for preserving the environment against negative factors. The following publication gives an overview Economic of the development of environmental protection. The impact of motorization, CO2 emissions and various fuels – fossil as well as biomass based fuels is given – are discussed in brief showing the need for future developments. The environmental requirements do not only have a huge impact on energy generation in industry and society. Environmental protection has generally great influence on everyday life and placed high demands on research, development and infrastructure. However, the economic aspect is very important. In the following, the requirements, influencing factors and effects of environmental protection are presented from the economic point of view, on the example of operating supplies.

KEYWORDS:
Environmental protection, CO_2 emissions, Industry and customer

INTRODUCTION

Environmental protection is a term meaning the entirety of all measures for the protection of the environment, with the aim to maintain the natural basis of live for all creatures by ensuring a functioning balance of nature. The term has become popular only in the last 40 years.

The need to limit or minimise the impact of technical progress to the environment increases with the same speed as the increasing desire for comfort and the increase of world population, both of which is connected with increasing need for energy.

Environmental protection focuses on individual components of the environment, such as the climate, the soil, water and air, as well as on their interactions. Further, damage to the environment caused by human impact in the past shall be corrected.

In the past years, the focus has shifted mainly to energy generation, which is predominantly due to the climate change and to the popular opinion that global warming has been caused by the increasing CO_2 contents in the air. This background implicates that it is necessary to turn away from using fossil fuels. As an aside, such turning away may be also desirable in order to secure supply.

The replacement of the fuels commonly used to date by alternative fuels, for the purposes of CO_2 reduction, will be possible and reasonable only if a whole series of requirements is met.

Significant investments will be required in basically all the steps of production, distribution and consumption, even if every action is taken to adjust all their features of the alternative fuels to the fuels used by now.

The environmental requirements do not only have a huge impact on energy generation in industry and society. Environmental protection has generally great influence on everyday life and placed high demands on research, development and infrastructure.

However, the economic aspect is very important. In the following, the requirements, influencing factors and effects of environmental protection are presented from the economic point of view, on the example of operating supplies.

Does environmental protection "pay off" after all?

THE "VALUE" OF ENVIRONMENTAL PROTECTION

Any reduction of environmental pollution, be it due to CO_2 emissions or other types of pollution, is desirable.

For many decades, the emphasis was placed on the function of machines; emissions were rather treated as an orphan. However, discussions about environmental pollution, particularly those in the USA, have led to a change of mind. For example, in California, air pollution was at some times so severe that the smog massively impaired sight and contributed to health concerns. Already in December 1952, thousands of people died in London from stagnant air pollution caused by heating with coal.

At the latest at those times, people started to reflect about ways how to reduce such emissions. In the late

70-ies and 80-ies, for the first time, exhaust catalysers were installed in vehicles powered by petrol, which was also supported by the government. Minor increases in fuel consumption were tolerated for the good of less unburned hydrocarbons and carbon monoxide being emitted.

The important question when implementing environmental protection measures is, what costs will incur and how much, for example, the emission on a ton CO_2 may cost the national economy. Only the answer to that question can tell whether it will "pay off" to support so-called "climate-friendly" renewable energies or to further the reduction of fuel consumption and motivate vehicle owners to retrofit emission-reducing means, or to even purchase new, more economic vehicles.

But how can we assess what taxes are appropriate on fuel and other sources of energy? By now, the taxes were determined based on the estimated damage to the environment and to public health, for which the general public must pay the costs. However, the costs and the benefits of environmental protection are vaguely defined.

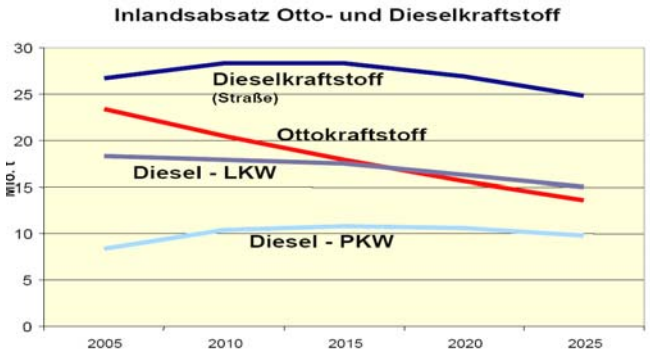
The [German] Federal Environmental Agency has now issued the recommendation, as for ensuing damage to the climate, to establish a cost rate of €70 / ton of CO_2 in all areas of application. The limits are set at €20 to €280 per ton. This background allows for further considerations.

Fuel Consumption and Vehicle Numbers in Germany

The total number of vehicles in Germany is approximately 50 million, divided into 41 million cars, a quarter of which is equipped with diesel engines, 4.5 million trucks and buses, and the rest being other vehicles.

The consumption of diesel fuel in Germany is about 30 million tons p.a., whereas petrol accounts for about 22 million tons p.a.

Approximately 150 million tons of emitted CO_2 are the result of motor traffic.



Title	*Domestic Sales of Petrol and Diesel Fuel*
Dieselkraftstoff	*Diesel Fuel*
Ottokraftstoff	*Petrol*
Diesel-LKW	*Diesel Trucks*
Diesel-PKW	*Diesel Cars*

Economic Reflection about CO_2 Emissions

For the reflection below, the assumption is made that a car has a lifetime of 150,000 km and emits an average of 200 g CO_2/km.

Based on the set €70/ton CO_2, this results in the emission of 30 tons of CO_2 over the lifetime of the vehicle and in total costs of € 2,100.

A 10% reduction of the consumption would reduce the CO_2 costs to € 1,890, which corresponds to a reduction by € 210 over the lifetime of the vehicle. For the operator, the costs for reducing the consumption would be approximately € 1,500 or 1ct/km.

Accordingly, halving the CO_2 emission - which, realistically, can be achieved only in the long term - would result in potential CO_2 savings worth € 1,050 per vehicle, which then could be reinvested into the development of the vehicles. With 1 million vehicles, this would correspond to 1 billion euro in "costs" over the assumed lifetime of 150,000 km per vehicle that could be invested into further development. This is a significant amount, which would certainly make a lot of development work possible.

A 10% decrease in diesel fuel consumption, corresponding to 3 million, would mean a reduction by approximately 9 million tons CO_2. With € 70/ton, this would lead to a cost reduction of € 630 million.

Promoting the installation of the particle filter in only 10% of the existing diesel-fuelled vehicles – i.e. in 1 million vehicles – would result in the payment of 330 million Euro incentives. This, again, corresponds to the costs for 4.7 million tons CO_2 and is therefore, mathematically, equal to the reduction of the consumption of approximately 1.5 million tons diesel fuel. Finally, this would correspond to a 5% reduction in the annual diesel consumption.

When looking at the 22 million tons of petrol for the 30 million vehicles with petrol engine, a 10% reduction of the consumption would correspond to a cost reduction of 154 million Euros, which is a background that provides sufficient scope for justifying sales-promoting measures and, as it was done with the scrappage premium, to also implement it. However, the scrappage premium need to be also viewed from the aspect involving the processing of many tons of raw materials and the energy input required for such production. After all, over 20% of emissions are generated during the production of the vehicle – as compared to the lifetime of the vehicle.

Summa summarum, however, considering other factors such as the energy consumption in the production of new vehicles, it can be said that a reduction of CO_2 emissions is and will remain a worthy goal.

Requirements to Fuels

For the evaluation of the quality of fuels as they are being generally used for combustion engines and especially in vehicles, specifications are applied that have been developed and established by consumers, manufacturers and public authorities over a long period of time.

Any developments within the industry are based on those specifications and, therefore, the use of fuels with different specifications will cause extensive changes in development and also in usage.

For the products demonstrated and specified in detail above, an infrastructure has been created over many

decades which cover all the necessary steps from the exploration and production, refining, storage and distribution, in order to facilitate and secure the continuous supply of large numbers of vehicles.

The development of a different system on the basis of alternative fuels, for environmental reasons, extensive efforts will have to be made, connected with accordingly large economic effects.

Fuels Based on Fossil Raw Materials Customary by Now

The given specifications of currently customary fuels represent the current minimum requirements. Changes can be expected from the further development of combustion engines considering the reduction of emissions.

Thanks to modern engine and fuel developments, consumption is reduced and this results in lower CO_2 emissions. However, it must be examined to what degree necessary modifications of the production process may result in smaller output and, in turn, again cause higher energy consumption.

Therefore, energy balances should be set up for the desired improvements.

The costs for adjusting the by now customary production and distribution system for fuels generated from fossil raw materials should be reflected in the budget with a lower amount than the construction of new production and distribution plants. The situation will be different after a complete switch to alternative products.

Fossil Fuels with Reduced CO_2 Emission

A reduction of CO_2 emissions on the basis of fossil raw materials, as another option, can be achieved only if the by now customary hydrocarbons with C-values of about 8 to 20 are replaced by lower-grade hydrocarbons with C-values such as 1 (methane) or 3 or 4 (propane/butane).

This is being done in different ways in different countries, by powering vehicles with natural gas (Compressed Natural Gas CNG) or petroleum gas (Liquefied Petroleum Gas LPG). In these cases, the CO_2 emission is simply reduced, because more hydrogen is available, as compared to carbon, for the combustion required to generate energy.

Similar reductions of the CO_2 emission are, from the start, also ensured when fuels are produced and combusted on the basis of renewable raw materials.

The costs for switching to hydrocarbons with lower C-values, which means basically to gas, requires not only plant modifications in the production and refining facilities as well as in the distribution channels, but also adjustments in vehicle components.

Renewable Raw Materials

The generation of these raw materials is, by principle, based on the photochemical reaction in plants, also called photosynthesis.

Products generated on this basis will, by principle, contain compounds with higher C-values; however, they have the advantage that they process carbon from the CO_2 contained in the air and, therefore, when combusted, they do not emit more CO_2 than had been extracted from air at an earlier point in time. In such cases, we speak of CO_2-neutral behaviour. However, this approach does not consider the comparison between the time when the raw material was generated, and the time of its later combustion.

Ways to Utilize Renewable Raw Materials

By principle, fuels from renewable materials can be produced according to consumer demand; with that, the advantages and disadvantages always have to be weighed.

Advantages and Disadvantages of the Use of Agricultural Basic Products

Opposed to the benefit of renewable raw materials from agriculture, is a series of disadvantages the largest part of which, however, can be eliminated by means of the corresponding investments and creation of infrastructure. The time factor cannot be neglected, either, as it is clear that these are long-term measures.

Utilizing Sun, Wind and Water Power

The requirement to generate energy without any release of CO_2 can be met if sun energy or its daughter elements, wind and water energy, are transformed into electricity. Provided there are suitable storage media, this energy, generated entirely without CO_2, can be then used for transport and traffic.

Sun power plants, as they have been put up already, focus sun beams on piping systems and heat up the working fluids contained therein which, in turn, overheat water by means of heat exchangers. The generated steam can power steam turbines in the usual manner which, in turn, power generators for electricity production. However, the storage of electric energy generated this way and ensuring its retrieval or usage on demand, still constitutes a problem. This also applies to wind and water power plants with their direct energy generation. Batteries for the storage of very large volumes of electricity are not available yet. A solution to this problem could be the generation and storage of hydrogen H_2.

Electric Vehicles

At this place, reference shall be made to electric vehicles which are powered without CO_2 production and also require CO_2-free generation of electricity.

The transformation of sun, wind and water energy into electricity, as described above, is particularly important in this context.

Adjustment of Industry and Consumer

Automotive Industry

The switch from the by now customary fossil fuels to alternative fuels, in order to reduce CO_2, will cause further developments in the automotive industry.

Despite of the already advanced state of technology, especially the application of electric drives, and there especially energy storage, still requires further extensive development.

Transportation Industry

The transportation industry, in particular the heavy goods traffic by trucks, will not be able to profit from the developments towards CO_2-reduced operation to the same extent as the car industry does, as the

development of electrically powered trucks in particular is still in its infancy.
However, as it is also the case for all diesel-powered vehicles, the operation with bio fuels can be relatively easily implemented, and is therefore worthwhile. The connected costs are reasonable.
Fuel Production
Large efforts will be required for setting up production of the same extent as currently exists for fossil fuels. A general question that arises is the availability of renewable raw materials, as some of them are foods, too, as we all know, which means that opposed interests need to be met.
Infrastructure
With regards to infrastructure, the existing infrastructure can be used for the application of bio fuels, too. However, it must be considered that, beside the storage and filling possibilities for the by date customary fuels, the same infrastructure must be created for additional fuels, which is connected with costs.
Transport and Distribution
The transport and the distribution can be secured via the existing distribution channels without any major investments, as these facilities require modernisation in regular intervals anyway.
Agricultural Production Capacity
Cultivation Areas, Crop Yield, Environment
Cultivation areas are just as limited as is the yield per hectare. For example, replacing 30 million tons of diesel fuel by methyl ester of rapeseed (bio diesel), with a yield of approximately 1,550 l/ha (about 1,350 kg/ha), equals to a required area of more than 20 million hectare of area to be cultivated. With an agricultural area of "only" 17 million ha in Germany, this is basically impossible.
Assumed that only 10% of the agricultural area would be used for bio diesel crops, this could not cover more than 8% of the demand.
This does not even yet consider the environmental impact of cropping, harvesting and production, as the cultivation of productive land is again connected with CO_2 emissions.
In the case of bio ethanol, the situation is similar, despite of the higher yield per hectare, as the so-called fuel equivalent is significantly lower and it must be accounted for an increase of about 40% in fuel consumption.

CONCLUSION

The traffic and transportation sector in Germany needs more than 50 million tons of fuel.
From these more than 50 million tons of fuel, realistically, not more than 5% can be covered by biological products from agricultural production in Germany.
While traffic is responsible for about 20% of CO_2 emissions, fuel production based on agriculture can contribute only to an insignificant extent to their reduction. Such contribution to the CO_2 reduction is very desirable, for reasons of eco-political considerations and decisions. All possible ways to reduce CO_2 emissions must be utilised, in order to reach the goal of falling 20% below the values of CO_2 emissions in the year 1990, which is a value that has been determined by the European Parliament within the frame of the climate package.
Therefore, it is imperative to exploit other sources of energy for traffic and transport. In principle, the only available source is sun energy, which in turn produces electric power and, with that, must and can provide power for vehicles.
A realistic calculation of the investments required for this new area is probably not yet possible. However, irrespective of economic aspects, the reduction of CO_2 emissions is desirable no matter what the case may be.

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