

# Green logistics - how to do it right

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## Abstract

In order to reduce greenhouse gas (GHG) emissions from transportation services, a paper wholesaler and a relocation company implemented the transportation industry solution developed by myclimate and Dr. Prof. Wittenbrink. The framework includes the following modules: carbon assessment, energy efficiency, analyses of the fleet and the logistic processes, employee training and awareness raising, annual environmental performance management. The performed analyses helped to identify room for improvements. Both companies have taken measures and are on the way to reduce their carbon footprint. As one of the companies started to replace diesel with biodiesel, the framework was extended by the aggregated environmental impact expressed in ReCiPe endpoints. This method was chosen to demonstrate possible negative side effects associated with the use of some biofuels.

## 1 The way towards greener transportation services

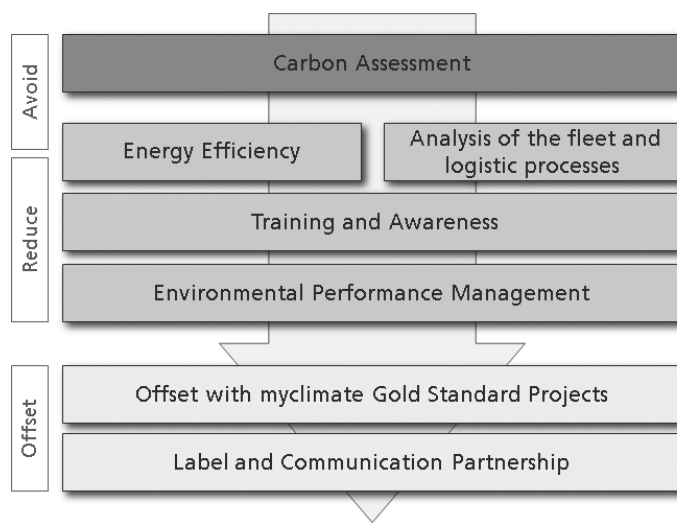
When talking about green logistics, the focus is often set on greenhouse gas (GHG) emissions. For responsible carriers and logistic companies, an effort to minimize those emissions is indispensable. The climate protection organisation myclimate and Prof. Dr. Paul Wittenbrink have developed an industry solution to measure, manage and reduce GHG emissions from the transportation industry [1]. The aim of the solution is to support companies on their way to reduce and avoid GHG emissions. The solution consists of different modules that help identifying weaknesses and room for improvements. In the consecutive years, the success of implemented measures is tracked (Fig. 1).

The three modules (1) carbon assessment, (2) energy efficiency and (3) analyses of the fleet and the logistic processes give an overview of the status quo of the company. In order to take all employees on board, a training course is essential.

Based on the findings from the first three modules and together with the company's staff, a catalogue of measures and a vision on how to reduce carbon emissions are elaborated by the organisation. In the consecutive years, the success of taken measures is tracked with an environmental management system.

The paper wholesaler Papyrus Switzerland Ltd. and the relocation company peyer bern were the first two companies to implement the system.

In this paper, the results of the fleet analysis of the environmental performance management of those two companies are presented.



**Fig.1: Framework of the transport industry solution**

## 2 Methodology

### 2.1 Fleet potential

The fleet potential analysis is based on several measures aimed at reducing fuel consumption. The following criteria are considered:

- engine technology
- aerodynamics
- optimisation of tires and reduction of the rolling friction
- utilisation of fuel-efficient engine oils
- utilisation of alternative fuels

- driver trainings
- telematics

The vehicles of the fleet are rated according to the grade of compliance with those seven criteria, e.g. if low-rolling-resistance tyres are used and an automatic tyre pressure controlling system is installed on all lorries, the rating for the criterion 'optimisation of tyres and reduction of rolling friction' is rated with the highest grade.

## ***2.2 Environmental performance management***

### **2.2.1 Goal and Scope**

The goal of the carbon assessment is to calculate the global warming potential (GWP) of companies of the logistics and transportation industry. Especially when considering biofuels, a good result for GWP is not always in line with other environmental impact categories [2, 3]. To cope with this difficulty, the aggregated environmental impact, expressed in ReCiPe endpoints, is included since 2010.

All inputs such as electricity, natural gas, diesel oil, consumables and infrastructure as well as direct emissions from fuel combustion and emissions related to waste disposal are considered. For the transport related emissions, the system boundaries are chosen according to the corresponding inventories of the ecoinvent database [4]. This means that 'well to wheel' emissions and emissions associated with the infrastructure (vehicles, road) are included.

### **2.2.2 Data inventory**

Primary data for all inputs as well as waste amounts are provided by the customer. The data is entered into an online performance management platform based on the system doCOUNT [5, 6]. The system processes the data and calculates GHG emissions and other impact categories automatically.

Emission factors are taken from the ecoinvent inventory V2.2 [4]

### **2.2.3 Impact assessment**

The global warming potential (GWP) with a time horizon of 100 years according to the Intergovernmental Panel on Climate Change – IPCC is considered [7].

Since 2010, the ReCiPe endpoint analysis (hierarchical perspective) is considered in order to account for other environmental impact categories as well [8].

### **3 Results**

#### ***3.1 Papyrus Switzerland***

##### **3.1.1 Fleet potential**

The fleet was considered to be relatively old. Wherever possible the modern vehicles (European emissions standard 4 and 5) are used. Older vehicles (European emissions standard 3 or lower) run fewer kilometres. Considering the criteria 'aerodynamics', 'optimisation of tires and reduction of the rolling friction', 'utilisation of fuel-efficient engine oils', 'driver trainings' and 'telematics', ratings achieved were 'high' to 'very high'.

When the analysis was performed, the company had no cars run on alternative fuels such as natural gas (CNG), liquefied gas (LPG) or biofuels. However, it was planned to test a lorry running with CNG.

It is emphasised that the company uses rail cargo for transportation whenever possible.

##### **3.1.2 Environmental performance management**

The first carbon assessment of the company with data from 2008 showed that over 50 per cent of the greenhouse gas (GHG) emissions were due to transportation of goods, either by company owned vehicles or by third party transportation services (rail or road). Energy consumption was the second most important cause for GHG emissions (22 per cent), followed by general consumables such as printed matter and office paper consumption (15 per cent). Commuting, business travel and waste only contributed between three to five per cent to the overall GHG emissions of the company.

The second assessment in 2009 showed that large economisations of natural gas could be achieved at the logistics centre of the company. The consumption decreased by 32 per cent compared to the previous year. Also a slight decrease of three per cent in electricity consumption was noted.

However, the GHG emissions from transportation in company owned vehicles increased by 15 per cent. This was mainly because the yearly driven kilometres were increased by 16 per cent, while the average fuel consumption was slightly lower. As the amount of transported goods did not increase significantly from 2008 to 2009, this indicates that the load factor of the lorries decreased.

The data collection for 2010 is not yet finalised, however there is already data for the energy consumption of the logistics centre and for the transportation in company owned vehicles. According to this first data, the natural gas consumption for heating could be lowered by further 8 per cent over previous year and electricity consumption was also slightly decreasing (four per cent compared to 2009). The total kilometres driven could be reduced, reaching the level of 2008. It is not yet possible to draw final conclusions out of this data, as it is not yet known how and if the amount of transported goods changed in the studied period.

## ***3.2 peyer bern***

### **3.2.1 Fleet potential**

The fleet was considered relatively modern. Wherever possible the modern vehicles (European emissions standard 4 and 5) are used preferably. Older vehicles (European emissions standard 3 or lower) run fewer kilometres. Considering the criteria 'aerodynamics' and 'utilisation of alternative fuels' the company was rated with high to very high grades. However there is still room for improvement in the following areas: 'optimisation of tires and reduction of the rolling friction', 'utilisation of fuel-efficient engine oils', 'driver trainings' and 'telematics'.

It is emphasised that the company has an own CNG filling station and is the first relocation company in Switzerland with CNG vehicles.

### **3.2.2 Carbon assessment**

So far, the carbon assessment was only performed for the year 2009. Not surprising for a relocation company, over 60 per cent of the GHG emissions come from their transportation services. Energy consumption is the second most important source of GHG emissions causing about 16 per cent of the total emissions, followed by waste disposal which causes about 15 per cent. The latter is mainly due to the fact that the company often disposes waste material from their

customers. Commuting causes about six per cent of the GHG emissions, while emissions from business travel and office material are almost negligible.

## **4 Discussion**

### ***4.1 Papyrus Switzerland***

The fleet potential analysis showed that the company has a good fleet. Some of the vehicles are rather old, however all other criteria were rated with high grades. Since 2010 the company is running a test with a CNG vehicle.

The analyses of the energy efficiency and the logistic processes (both not described in this paper) showed weaknesses and room for improvement in the following areas: (1) heating of the logistics centre and (2) load factor of the vehicles.

The first measures to improve the heat management in the logistics centre were taken by mid-2009. The effects of those measures could be tracked with the environmental performance management system, proving that there were significant economisations of natural gas for heating.

As the analysis of the logistic processes was done by the end of 2009, first effects of improvements can be seen in the (on-going) assessment for the 2010 data. The first data indicate that the driven kilometres could be decreased. It is assumed that the load factor could be increased. However, as stated above, a final conclusion can only be drawn after the data collection is completed. Important data such as the amount and weight of transported goods is still missing.

### ***4.2 peyer bern***

Although the fleet is rather modern, the fleet potential analysis showed some weaknesses regarding other energy saving measures such as the use of high quality lubricant or low-rolling-resistance tyres.

However, the company is a pioneer regarding alternative fuels. When the fleet analysis was performed, the company had three CNG vehicles. Since 2011, the CNG vehicles are powered with biogas. The diesel vehicles are partially powered with biodiesel (from waste vegetable oil).

The second assessment with the environmental performance management system will show the effects of those measures on the carbon balance.

## **5 Driving greener and greener**

### ***5.1 Benefits for the companies***

Both companies are aware of the fact that their business has an influence on the environment. They are keen on reducing their carbon footprint as much as possible while providing high quality services to their customers.

The companies are operating in different markets. Papyrus is mainly acting in a Business to Business (B2B) market. Their customers are primarily print shops which demand high flexibility. Customers want to be able to order paper that is delivered the next day or sometimes even the same day. This is a challenge for planning routes and improving load factors of vehicles. Especially the express deliveries cause a problem, because rail cargo can only be used for overnight deliveries. In the Swiss printing market, carbon neutrality is an important topic. Therefore print shops also expect that their suppliers provide environmental friendly services. However, as customers demand greener services, it is essential that they do their part as well. It is important that customers understand that services like express deliveries on the same day have a higher environmental burden than normal overnight shippings.

In contrast, peyer bern as a relocation company is operating in the Business to Business (B2B) and the Business to Customer (B2C) market. Especially when operating in a B2C market, climate friendly services are a competitive advantage. In the case of peyer bern, which is a pioneer in alternative fuels, the transportation industry solution is a good way to prove the effectiveness of taken measures and to communicate those benefits to the customers.

Both companies, Papyrus Switzerland and peyer bern, decided to offset the unavoidable emissions from their transportation services and offer all their transports climate neutral. The good news is that the story does not end here. It is a stated goal of both companies to further reduce their GHG emissions. Using the environmental performance management system, their success in doing so can be tracked and reported.

### ***5.2 Do not overshoot the mark***

When looking only at GHG emissions, biofuels seem to be a good solution. However, as several studies proved, biofuels have other environmental impacts that should not be left aside [2, 3]. The environmental performance management

system first only covered GHG emissions. When peyer bern started to use biodiesel, those impacts could no longer be left aside. Therefore the aggregated environmental impact, expressed in ReCiPe endpoints was added to the system. In the actual case with peyer bern, the environmental impact of the used biofuel causes no significant problems, as they decided to use biodiesel made of waste plant oil. However, if a company would use biodiesel from primary sources, it is important to emphasise on this problem.

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