



Publishable Result-Oriented Report

Containing lessons learned and recommendations

Programme area:	<i>IEE, STEER Action, 9.2 mainly</i>
Status:	<i>Completed</i>
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Partners:	<i>10 partners from 9 countries</i>
Website:	<i>http://www.recodrive.eu</i>
Objective:	<i>Implementing, testing and promoting CO₂ savings via Sustainable Fleet Management comprising</i> <ul style="list-style-type: none">• <i>Eco-driving</i>• <i>Technical configuration options in vehicles</i>• <i>Car policy configuration</i>
Benefits:	<i>Lower CO₂ Emissions, Less Fuel Consumption, Image gain sustainable fleets</i>
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1 Overview

1.1 Introduction

The United Nations' Climate Change Conference in Copenhagen in December 2009 drew the attention to the fact that climate change is a threat to life on our planet. Our burning of fossil fuels, such as oil and coal, is increasing the average temperature in the atmosphere, potentially leading to severe consequences for humans and other living species.

Though a global, legally binding political agreement on climate policies still lies ahead of us, **the transport sector is among the sectors that have a great potential for reducing their emissions**. In 2005, 20% of the CO₂ emissions from the EU countries came from road transport, and emissions are increasing. Changing this trend does make a difference. Fleet owners can reduce their emissions, and at the same time save money, by reducing their fuel consumption.

A company can reduce its fuel consumption by choosing the best available vehicles and equipment, focusing on fuel consumption in route planning and logistics, and adopting an energy-saving driving pattern. This leads to long-term savings and increased competitiveness for the company.

The RECODRIVE project helped fleet owners to achieve this goal. The key to success is an appropriate focus and motivation among the entire staff, including management, drivers and staff working on procurement, operational logistics, and maintenance. RECODRIVE developed and tested rewarding- and recognition schemes aiming at insuring a sustainable reduction in fuel consumption.

Through its work, the RECODRIVE project also contributed to fulfilling EU transport policies and regulations by strengthening the focus on fuel efficiency in procurement, maintenance and route planning, and encouraging energy-saving driving patterns.

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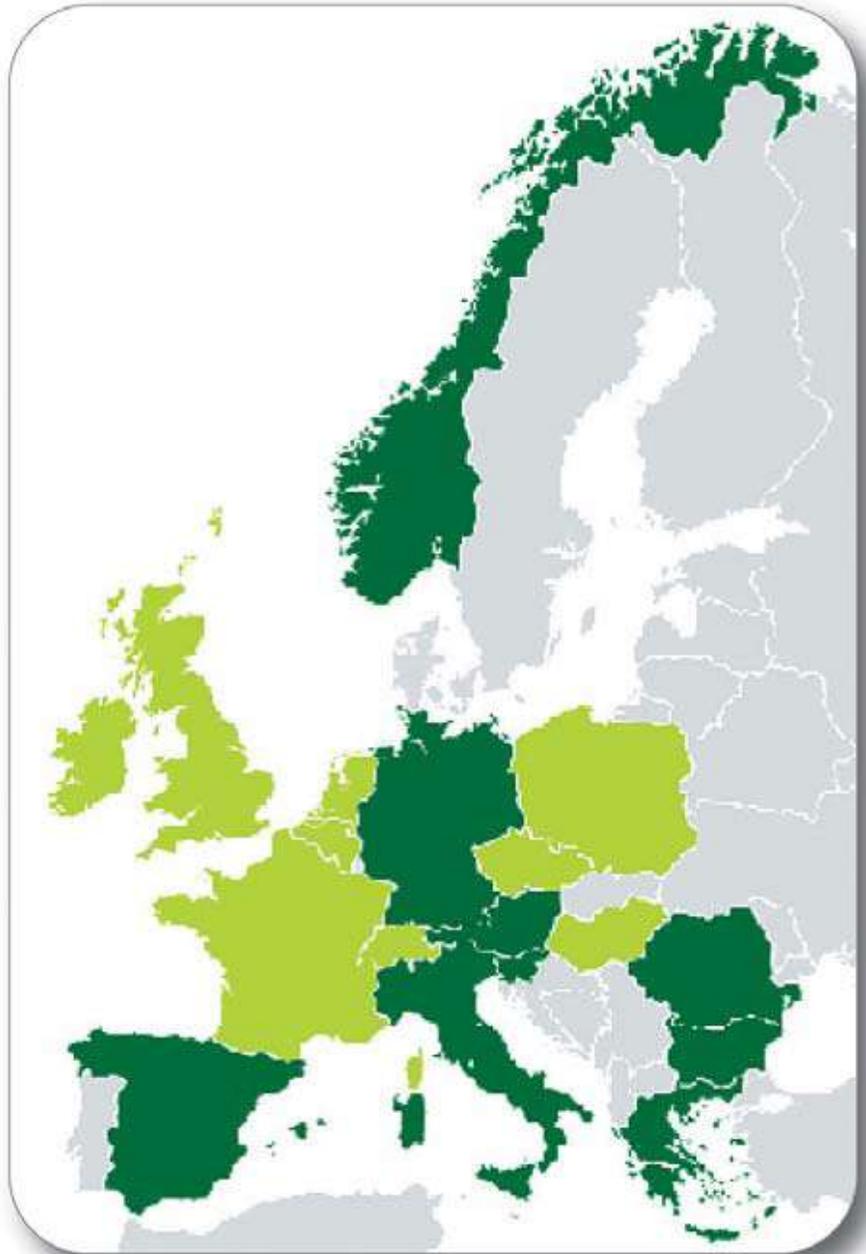
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1.2 Partner list

The RECODRIVE consortium consists of the following partners in nine European countries:

- Austria, Forschungsgesellschaft Mobilität -Austrian Mobility Research gemeinn. GmbH
- Austria, Rathgeb KEG
- Germany, FleetCompany GmbH
- Greece, IDEC S.A.
- Bulgaria, IVECOL Consult Ltd.
- Romania, Uniunea Romana de Transport Public (URTP)
- Italy, Trasporti e Territorio Srl. (TRT)
- Norway, Western Norway Research Institute (WNRI)
- Spain, BESEL S.A.
- Slovenia, University of Maribor



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1.3 Demonstrator list

RECODRIVE included various transport sectors (company fleets, freight transport, public transport, waste collection) in the demonstration, allowing a distinction of the recommendations regarding the suitability of rewarding and recognition schemes.

Austria	Bacher Touristik GmbH Ebner Reisen GmbH Landecker Verkehrsbetriebe Öztaler VerkehrsgesmbH Tyroltours GmbH
Bulgaria	Stolichen Autotransport Plc.
Germany	BTI Befestigungstechnik GmbH Deutsche Post AG SONY Deutschland GmbH Stuttgart Technology Center Vodafone D2
Greece	Papadopoulos Trans
Italy	Larivera SpA
Norway	Bergen Municipality BKK - Bergen intermunicipal power company BIR - Bergen intermunicipal renovation company
Romania	Regia Autonoma de Transport Craiova - RAT Craiova
Slovenia	Avtobusni promet Murska Soboty Viator&Vektor Snaga Maribor Surovina Radlje do Dravi
Spain	EMT Madrid

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1.4 Follower list

RECODRIVE awarded additionally to the initial plan certificates to followers signing a target for CO₂-reduction. The field of application of the RECODRIVE scheme was thus widened, both in terms of numbers and types of fleets.

Austria	GrazAG Verkehrsbetriebe
Bulgaria	Union Ivkoni Plc
Greece	Cerebral Palsy Greece
Romania	SC Transport Public SA, Alba Iulia SC CTP SA, Arad SC Transport Public SA, Bacau SC Transmixt SA, Bistrita SC Tehnorom Impex Srl, Bistrita SC Eltrans SA, Botosani RAT, Brasov SC Braicar SA, Braila RATC, Constanta RATP, Iasi RATUC, Cluj Napoca
Slovenia	Izletnik Celje d.d. Surovina družba za predelavo odpadkov d.d.
Spain	GUAGUAS Municipales, S.A. San Sebastian (Dbus) NH Hoteles, S.A. SEUR (SEUR GeoPost) Ayuntamiento de Murcia - Municipality of Murcia Madrid Movilidad
Portugal	Horários de Funchal, Transporte Públicos S.A.

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1.5 Short description incl. objectives

Sustainable fleet management in Europe

Since the 1990s, European policies have become more focused on energy efficiency in transport. The aim was to disconnect mobility from its negative side effects. To achieve this, the EU supports action including voluntary agreements, research and the demonstration and introduction of new technologies.

However, a broader transport policy toolbox is needed in order to achieve the fundamental objectives of EU policy. In this context, energy-saving concepts, including eco-driving and sustainable fleet management, are essential. Energy saving is promoted by encouraging standards, such as the international ISO 14001 and the European EMAS, and tools for Environmental Management Systems (EMS).

RECODRIVE contributes further to the enlargement of this toolbox. The project promotes voluntary commitment to fuel savings in the transport sector. Through the RECODRIVE approach, companies are demonstrating how to save fuel by integrating good practices in all parts of the fleet management. This includes procurement, route planning, maintenance, and driver training.

Fleet sustainability – reducing CO₂ emissions

The aim of RECODRIVE is to contribute to a sustainable reduction of energy use in the transport sector, and thereby a reduction in fuel consumption and fuel costs which will stay.

In order to achieve this, it is necessary to develop an integrated concept for the entire fleet management:

- Eco-driving
- Technical configuration options in vehicles
- Car policy configuration

In order to make fuel savings sustainable, RECODRIVE also develops rewarding and recognition schemes for motivating employees.

The revolving process for sustainable reduction in energy consumption is illustrated in the figure to the right.

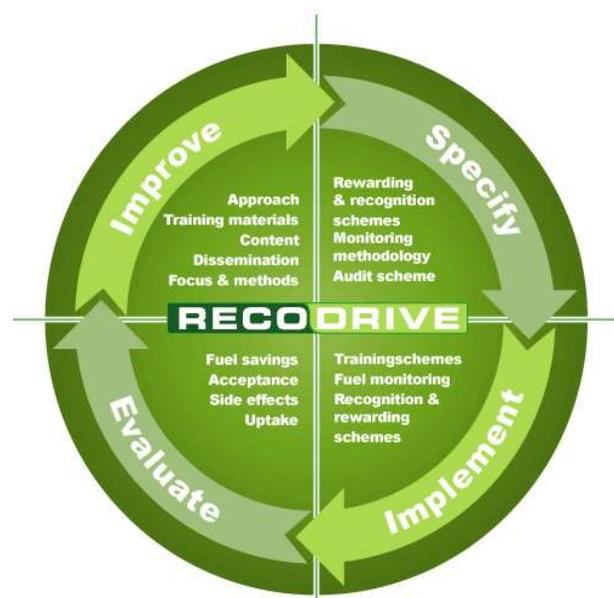


Figure 1: RECODRIVE quality circle

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Finding a strategy for sustainable fleet management

Good fleet management is the key to success – for fuel savings and for running your fleet efficiently.

RECODRIVE gives advice on efficiency in all parts of your fleet management.

This helps you reducing emissions, saving money, and increasing your competitiveness!

Purchasing the right vehicle

The most important decisions for saving fuel are often made even before the vehicles have been purchased. Look for the most fuel efficient vehicles, and go for the smallest vehicles possible fulfilling your everyday needs. Do not specify for 99.99% since you might use/rent different vehicles for more demanding trips. Also consider alternative fuels when possible, such as electric, hybrid electric technology lowering the energy consumption or to biofuels lowering the CO₂-emissions.

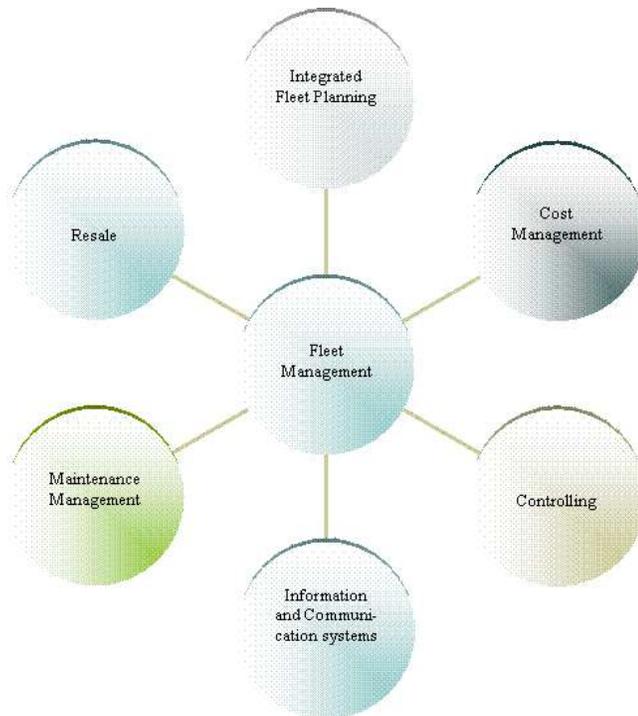


Figure 2: Elements of sustainable fleet management



Figure 3: Look for the most fuel efficient vehicles and go for the smallest vehicle according to your needs

passenger cars special efficient versions are available from most brands having improved engines, aerodynamics and low resistance tires. When climbing to high altitudes daily, the weight reduction of the vehicle is of special importance.

Monitoring devices and on-board equipment help reducing costs. Such does equipment measuring driving patterns and fuel consumption. It also helps finding more efficient routes, or tells when vehicles should be given maintenance. Remember to take employee privacy into consideration, when defining recorded data, according to national culture and regulations.

Investing in extra equipment for the vehicle may also lead to fuel savings. For instance, having the right trailer for the truck, the right deflector and extra sideskirts may reduce the aerodynamic drag of your vehicles considerably. With

passenger cars special efficient versions are available from most brands having improved engines, aerodynamics and low resistance tires. When climbing to high altitudes daily, the weight reduction of the vehicle is of special importance.

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Keeping vehicles in shape

Several simple actions can keep a vehicle’s fuel consumption down. This is related to:

- Maintenance
- Efficient exploitation of the vehicle
- Driving style and drivers monitoring

Regarding maintenance, avoid e.g. excess weight, under-inflated tyres, and leaking pneumatic systems. In-depth analysis can reveal more potential improvements.

Efficient exploitation of vehicles means good logistics, efficient route planning, and aerodynamics adapted to the load hull. Also make sure that staff doesn't carry around excess loads.

Monitoring may optimise driving patterns, route planning and logistics. Remember to take privacy protection into consideration. The privacy of employees is emphasised more strongly by labour unions in some countries than in others.

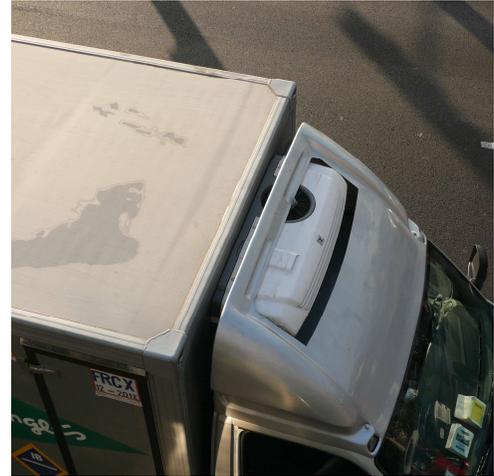


Figure 4: Well-adjusted deflectors reduce fuel consumption

Eco-driving

By learning and implementing eco-driving, drivers can reduce fuel consumption considerably, often around 10 to 15% during training. However, drivers tend to fall back to old habits quite quickly. Thus, recognition and rewarding schemes are important in order to motivate staff to sustain their new habits.

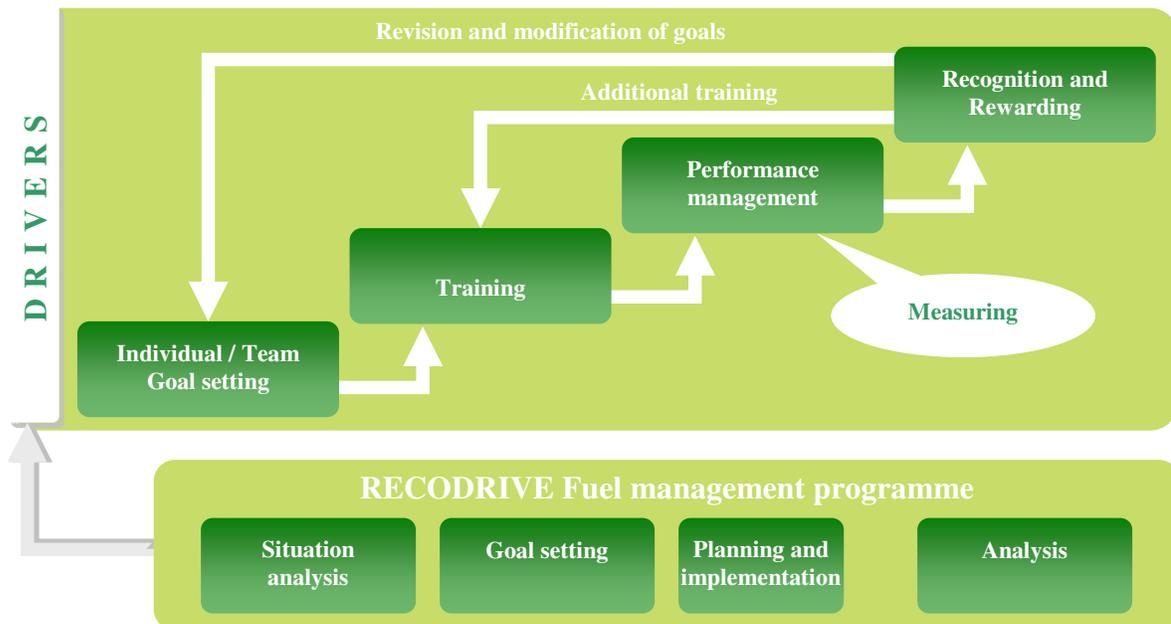


Figure 5: Ways of carrying out driver trainings



Staff is the key

For companies that want to save fuel, the staff is crucial. Employees must be motivated for saving fuel, and for sustaining good habits over time. A key element in RECODRIVE is to set up a rewarding and recognition scheme to help the staff doing that extra effort every day.

Good communication

There is no universal rewarding or recognition scheme. How to best set up such a scheme will vary according to working culture and national culture.

In any country, staff must feel respected, trusted and listened to at their own premises in order to be motivated. However, the way managers communicate respect for, and trust in, their employees, varies between countries. In some countries, managers communicate their respect by showing concern for the employees' whole life, whereas in other countries they show respect by not intruding their private sphere. Employees have expectations to their managers accordingly.

Finding the right reward

National and cultural features also determine what type of reward is considered appropriate. In some countries, explicit, monetary rewards are regarded the most efficient. In other countries, such schemes will be less popular due to a culture of treating all employees equally. Here, collective rewards, possibly connected to employees' spare time, may be more appropriate. The reward must, however, be considered a big enough to be worth working for.

Some criteria for getting support for rewards among employees:

1. Individuals should see a clear line between what they do and what they will get for doing it.
2. The rewards should be worth having.
3. There must be fair and consistent means for assessing performance, so that all have the same chance of getting the reward.
4. People must be able to influence their performance, by changing their behaviour and developing their competences and skills.
5. The reward should reflect as closely as possible the accomplishment that generated it.



Figure 6: LARIVERA bus company driving team, a successful RECODRIVE demonstrator

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10 Commandments for Rewarding and Recognition Schemes

1. Involvement of employees and the management alike is a success factor, in a combination of a top-down and bottom-up process.
2. Motivation can be either intrinsic or extrinsic. Both should be considered!
 - Intrinsic motivation means that the individual employee believes that fuel saving is good for the environment. Reducing fuel consumption thus gives a feeling of personal accomplishment. This kind of motivation is likely to have a deep and long-term effect.
 - Motivation can also be extrinsic, meaning that fuel saving is done to achieve something else, for instance a monetary reward. This can have powerful effects, but it would not necessarily last long.
3. There is no universal rewarding scheme. The company must establish a local image of the task, and there must be a mutual understanding within the company.
4. Be prepared for implementation challenges! Consider thoroughly the conditions for implementation, and be consistent.
5. The scheme must be adapted to national and company culture.
6. There should be a feeling of justice, both in how rewards are provided to employees, and in the ways that rewards are put into practice.
7. The rewarding process should be characterised by equity, consistency, and transparency. Equity means that all employees are rewarded fairly, under the same conditions. Consistency implies that decisions do not vary arbitrarily. Transparency exists when people understand how reward processes function and how they are affected by them.
8. Be aware of the task's characteristics. If the task needs close and intimate coordination with others, low reward differential is preferable. If the task doesn't require coordination and cooperation it can be preferable to implement high rewarding differentials.
9. Nonmonetary rewards may be more difficult to value than monetary rewards. Such schemes may also run into taxation problems, depending on national legislation.
10. The result from a preliminary study indicates that companies tend to consider monetary rewards more suitable. Bonus systems are considered more appropriate than result-based wages.

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1.6 Project summary

RECODRIVE (Rewarding and Recognition Schemes for Energy Conserving Driving, Vehicle Procurement and Maintenance) was a project partly funded by the European Commission under the Intelligent Energy Europe Programme promoting energy saving measures in the transport sector with the main objective to diminish the CO₂ emission. RECODRIVE focussed on operation (driving and maintenance), equipment of vehicles and route planning. Whilst previous approaches only focused on the driving style, RECODRIVE involved the whole staff including maintenance and procurement staff in the energy saving process, also by implementing rewarding and recognition schemes in order to guarantee long-term energy savings. The past has shown that driver trainings are leading to good results, but are only energy-saving for a limited period of time due to the fact that the responsible staff is not rewarded for its achievement nor got recognition. RECODRIVE focused on a more holistic approach by integrating drivers, procurement, maintenance and management staff in the energy saving process.

Due to the fact that training alone does not have a long-term impact on the energy and CO₂ savings, rewarding and recognition schemes were developed and tested by the project demonstrators in nine European countries. The implementation of a rewarding scheme is able to push the long term effect tremendous and also raises the awareness of the staff. A positive side effect – which has not been measured within the project: The staff becomes aware of how to save energy and can also apply the same measures in their private life.

RECODRIVE managed to attract fleet operators by presenting the fuel savings of the project demonstrators.

Furthermore RECODRIVE can present tested rewarding and recognition schemes in various transport sectors.

The objective of achieving 15% energy saving as average of the demonstrating fleets within the lifetime of the project was ambitious, and can only be achieved after a longer period of time. It has to be underlined that all demonstrators (some of them quite reluctant at the beginning of the implementations) could observe savings in terms of CO₂ emissions and finally were infected with the RECODRIVE virus, which means that they are keen on working on the idea by themselves by implementing more measures also after the end of the project. Although the highest savings could not be measured in RECODRIVE, they will take place in the near future and thus we can be proud of the project results.

Demonstrators

All demonstrators could be convinced that an integration of the procurement department is substantial for a successful reduction of the CO₂ emissions and they will implement these measures ongoing. Some started with the involvement of the procurement already; however the replacement of the vehicles will need several years and so can be the effects.

The demonstrators acted as forerunners and therefore they contributed and will contribute to the further circulation of the RECODRIVE idea.

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Followers

The followers implemented measures already within the lifetime of the project and were awarded therefore with the Follower Certificate. The CO₂-savings were predicted and followers were committed to that.

Target groups

It was decided to work and develop measures together with fleet operators in various fields of activities. The reason for this approach was that it makes more sense to gather direct impacts of the implemented measures. In this process consulting companies were involved.

Private car users and legislative bodies are addressed by the project output comprising downloadable information on the website. It is necessary to show hard facts and not only ideas for convincing them to step in. Therefore the “Lessons Learned” (RECODRIVE deliverable D5.2, public) has been split in two parts: Lessons learned and Policy guidelines for sustainable fleet management. Due to the fact that some of the project partners participated in the project with company cars, these drivers could be addressed directly. By involving the whole fleet staff in the energy saving process, the staff could realise that it is possible to save money and CO₂ emissions by simple means. It can be assumed that the staff members use their acquired knowledge also in their private life – at least for saving money.

Various companies from all partner countries have tested the applicability of different fuel saving measures on one hand and on the other hand the demonstrator companies have validated the recognition and rewarding schemes as important influential factor supporting sustainability of achieved results. 21 companies have joined the project’s demonstration with 1,100 vehicles out of which:

- 263 urban buses,
- 5 coaches,
- 48 long distance freight trucks > 16 tons,
- 674 cars,
- 7 vans,
- 92 trucks < 7.5 tones,
- 11 waste collection trucks > 7.5 tons.

As the companies involved in the RECODRIVE demonstrations perform various transport operations which are not directly comparable, the demonstrator companies are grouped according to their fleet and operation type (public transport, freight transport, utility fleets, waste management). As each fleet type was analysed, it was ascertained that achieved fuel saving vary among the same type which is explainable with the different approaches to fuel saving interventions and recognition and rewarding schemes that were or were not implemented. Due to the fact that the approach to implementation of fuel saving interventions or rewarding was not uniform in is inappropriate to directly compare savings even within the same fleet type. Nevertheless fleet-related recommendations are given for each specific fleet type that enable insight to implemented measures and achieved results.

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Several representative case studies show different approaches to recognition and rewarding schemes. The case studies are focused on the recognition and rewarding scheme implemented enabling the reader to discover various approaches to rewarding and the effects of schemes that were applied. The majority of presented case studies present different forms of financial rewarding that is probably easier to implement however the effect might fade over certain period of time which is typical for financial rewarding. The case studies should help interested followers to develop their own recognition and rewarding schemes.

Deriving from experiences gained in the demonstration period recommendations for fleet managers are summed up regardless of the fleet type. The most interesting and useful recommendations for fleet managers are:

- Focus on fuel saving should be permanent and continuous in order to achieve reduction of fuel consumption
- Strong support from top management is essential for success
- Monitor fuel consumption regularly, use the information and give feedback (periodical reports to drivers, management and maintenance)
- Adapt training to vehicles in the fleet
- Constant periodical feedback to the drivers can function as a motivational impulse even without recognition and rewarding scheme
- Procurement should be well planned as vehicle's specifications must correspond to the operational requirements

Fleet managers interested in fuel saving measures should be able to find more useful tips and recommendations based on real experiences gained in the RECODRIVE demonstrations.

But even though positive results were achieved, it is unrealistic to expect that companies would be able to achieve these results without strong external support. The demonstration has shown that transport companies usually do not have sufficient human and financial resources that could be allocated to the implementation of sustainable fleet management. Additionally, companies in general are not aware of the benefits of sustainable fleet management and lack the needed expertise to implement it in practice. However it is important to point out that companies are interested in implementing fuel saving interventions and measures that ensure long term results.

1.7 Dissemination activities, project deliverables

1.7.1 Project website

RECODRIVE has set up a project website with useful information for fleet operators. The website is assisting in finding a useful implementation approach for different types of fleets.

The awareness of the participating fleets – demonstrators and followers – with regard to ecologic impact could be raised.

The website offers in the audiovisual section a film which gives an overview about the RECODRIVE activities and the idea behind the project.

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The news section offers various information, ranging from financial incentives on electric vehicles, handing outs of certificates, to videos – some produced especially for the project. When choosing the local language in the red top corner, news in the local language are visible (in case of availability).

The website comprises the following chapters:

- Project description
- News
- Motivating articles
- Questions & answers
- Lessons learned
- Download area
- Glossary
- Amortisation calculator
- Case studies
- Events
- Newsletter

Figure 7: Screenshot of the RECODRIVE website (www.recodrive.eu)

1.7.2 Follower certificate

The follower certificate was not only spread by the project partners, the project website also contained an application form for the follower certificate, where interested companies could directly apply for obtaining a certification.

1.7.3 Advertising

In Austria a small e-car was used for publishing the RECODRIVE url. It was a unique advertising space. The e-vehicle was put in public places for attracting a maximum of persons passing by.

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1.7.4 Publications

The project partners published articles in various printing media – newspapers and magazines in Austria, Greece, Romania and Slovenia.

- Article in the newsletter of the Country of Styria (Austrian Mobility Research, Austria)
- Newspaper online publication (Austrian Mobility Research, Austria)
- Online publication at eco.at (Austrian Mobility Research, Austria)
- Publication in the magazine “Verkehr” (Austrian Mobility Research, Austria)
- Naftemporiki economic newspaper (IDEC, Greece)
- 5 magazine publications (URTP, Romania)
- 2 newspaper publications (University of Maribor, Slovenia)
- 2 magazine publications (University of Maribor, Slovenia)

The discussion in the media was initiated and will go on – due to the networks of the partners und also due to the participating fleets. FGM also contributed to a publication of fuel saving initiated by the Grazer Umweltamt (environmental office of the city of Graz).

1.7.5 Newsletters

5 RECODRIVE newsletters have been produced (every 6 months) during the project. The newsletters contain information about the demonstrators and about the proceedings of the project and can be downloaded from the RECODRIVE website (www.recodrive.eu).

1.7.6 Brochure

The brochure can be downloaded from the website in English, Spanish and Romanian. The brochure and newsletter 5 are presenting the main documents with the results of the RECODRIVE project in short.

1.7.7 Public deliverables

The following public deliverables have been produced in RECODRIVE and can be downloaded from the website - www.recodrive.eu:

- Baseline Analysis (D2.1)
- White paper introducing new sustainable fleet management schemes (D3.2)
- Proceedings, monitoring records for the demonstration – public summary (D4.1)
- Guidance sustainability in fleets (D4.2)
- Reference training materials incl. hands on training (D4.3)
- Lessons learned & policy formulation (D5.2)

1.8 Achieved results

A great variety of fleets could be gained for participating as demonstrators in the project. The fleet types comprised public transport fleets (local and regional), long distance haulage (international), company car fleets and waste collection.

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The participating fleets tested lots of measures that could be taken in order to save fuel – from driver training (ecodriving) which was part of all demonstrators, also improvement of maintenance and procurement, implementation of recognition and rewarding schemes (for drivers, maintenance, procurement and management).

We had to realise that the type of rewarding scheme has not only to be adapted to the type of fleet, but also to the region. Due to this reason we provide generic hints for implementing rewarding and recognition schemes from which guidelines for the specific types of fleets might be derived. Technical eco-driving guidance is given for all types of fleets separately.

Most participating fleets surpassed their ambitious aims with regard to fuel saving!

- Drivers were impressed that the use of eco-driving techniques could increase average speed saving time, not only money
- The measures to be taken are highly depending in the first instance on the type of fleet (secondly on the country and the company structure)

In addition to the project demonstrators – various types of fleets in all nine participating countries – followers could be attracted by the RECODRIVE certificate. They joined the RECODRIVE initiative by implementing the already tested measures and managed also to monitor remarkable savings in terms of CO₂ savings. The project partners were looking for followers, but the whole consortium was astonished at the tremendous feedback.



Figure 8: Follower certificate

1.9 Results from the demonstrators

The follower certificate was also published on the RECODRIVE website even though the followers could be attained by word-of-mouth recommendation by the project partners and demonstrators.

1.9.1 Freight sector

Filling the tanks – but not the fuel tanks

The Greek transporting company Papadopoulos Trans carries mostly liquid food all over Europe with its 42 heavy trucks. The company has reduced costs and environmental impact considerably by using some simple fuel saving measures.



Figure 9: A truck at Papadopoulos Trans is now using less fuel than it used to

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Papadopulos Trans started the cooperation with the RECODRIVE partner IDEC in late 2007. In the first semester of 2009 the average diesel consumption had declined by 5.6 percent, explains Georgia Papadopoulou, fleet manager in Papadopoulos Trans.

Drivers have been trained by implementing quality circles, where the drivers themselves have found ways to save fuel. Fuel consumption has been monitored using GIS and software already in use, so no technological modifications were needed.

We are working on setting up a rewarding scheme, and we are convinced that this will encourage the employees further, Georgia Papadopoulou says.

She encourages other freight companies to have a long-term perspective and take their time to find the most suitable rewarding scheme.

1.9.2 Public transport sector

Bus company saves large sums

The public transport company EMT Madrid has since 1990 saved large amounts of fuel by implementing simple measures. 20 years later, a constant focus on fuel economy still leads to new savings – helping the environment and the economy alike.

One important aspect for EMT is using the vehicles efficiently. In June 2009, more than 50% of drivers, 3,159 drivers altogether, had been trained in eco-driving. They had achieved an average reduction of fuel consumption of 15% during training.

EMT joined the RECODRIVE project in order to find measures to save even more fuel. A team of drivers that were already trained in eco-driving got extra attention. The result was additional savings of 3.4%, achieved mainly due to the implementation of a recognition scheme that motivated the drivers. This may not sound much, but a saving of 3.4 % in the whole EMT fleet would mean a saving of more than two million litres of fuel per year!



Figure 10: Driver training and rewarding schemes were a success in EMT Madrid

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1.9.3 Local utility services

Power company sees saving potential in route planning

The Norwegian power company BKK's section for the planning, building, and maintenance of power grids (BKK Nett) was a demonstrator in the RECODRIVE project. They have gained useful experience on fuel saving in local utilities services.

“We have considered fuel saving measures in all parts of our fleet management. Quickly we realised that for us, the largest saving potential lies in our **logistics and route planning**”, says Torstein Kvarekvål, service advisor in BKK.

BKK Nett's staff is driving their light vans long distances every day, in order to secure a reliable delivery of electric power to the area.

“Efficient logistics and route planning has a tremendous influence on the mileage. For instance, the employees drive shorter distances, if they share vehicles, or if they do not need to drive too far in order to get necessary equipment”, Kvarekvål explains.

BKK Nett is now purchasing a GPS-based route planning system, and will continue to focus on this issue in the years to come.



Figure 11: Maintaining power grids require a lot of driving. Good logistics and maintenance helps BKK reducing mileage considerably

1.9.4 Individual transport

Gaining at work

Companies that implement fuel saving measures also help staff saving money in their sparetime. In the German demonstrating companies, the RECODRIVE approach inspires employees to improve their private economy by saving fuel. René Liess, working for the German partner FleetCompany, explains how.

“The employees in our demonstrating companies have learned easy techniques to save fuel, among other things by energy efficient driving. They are of course encouraged to take this knowledge home and save fuel and money in their private life as well”, Liess explains.

The demonstrating companies in Germany have primarily focussed on sales employees, in consumer electronics, telecommunication, and builder's merchandise. The participating employees were impressed about the advantages of ecodriving.

“They were astonished by the saving potential, but also by the fact that ecodriving increased their average driving speed”, Liess says:

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‘The drivers were trained in a driving school, achieving an immediate reduction of fuel consumption of between 5 and 10 percent.’

2 Demonstration

In the following table the participating demonstrators are listed grouped according to their fields of operation.

	Company	Total number of vehicles	Number of vehicles involved	Country	Fleet type
Public transport					
1.	RAT Craiova	135	4	Romania	Urban buses and coaches
2.	EMT Madrid	2,062	3	Spain	
3.	Bacher Touristik GmbH	50	50	Austria	
4.	Ebner Reisen GmbH	15	15		
5.	Landecker Verkehrsbetriebe	20	20		
6.	Ötztaler Verkehrsgesellschaft mbH	30	30		
7.	Tyroltours GmbH	25	25		
8.	Stolichen Autotransport Plc.	650	110	Bulgaria	
9.	Avtobusni promet Murska Sobota	70	6	Slovenia	
10.	Larivera SpA	143	5	Italy	
Freight transport					
11.	Papadopoulos Trans	42	42	Greece	Trucks > 16t
12.	Viator&Vektor Logistika	190	6	Slovenia	
Utility fleets					
13.	Bergen Municipality	711	4	Norway	Cars
14.	BTI Befestigungstechnik GmbH	600	600	Germany	
15.	SONY Deutschland GmbH Stuttgart Technology Center	34	34		
16.	Vodafone D2	3,000	36		
17.	BKK Nett	400	7	Norway	Vans
18.	Deutsche Post AG	40,000	92	Germany	Trucks < 7.5t
Waste management					
19.	BIR	65	5	Norway	Trucks > 7.5t
20.	Surovina Radlje ob Dravi	16	3	Slovenia	
21.	SNAGA Maribor	24	3		

Table 1: Companies participating in the demonstration

In total 1,100 vehicles participated in the demonstration. Cars turned out to be the majority of vehicles involved in the demonstration, with urban buses and coaches representing the second largest but higher mileage group of vehicles – as shown in Figure 12.

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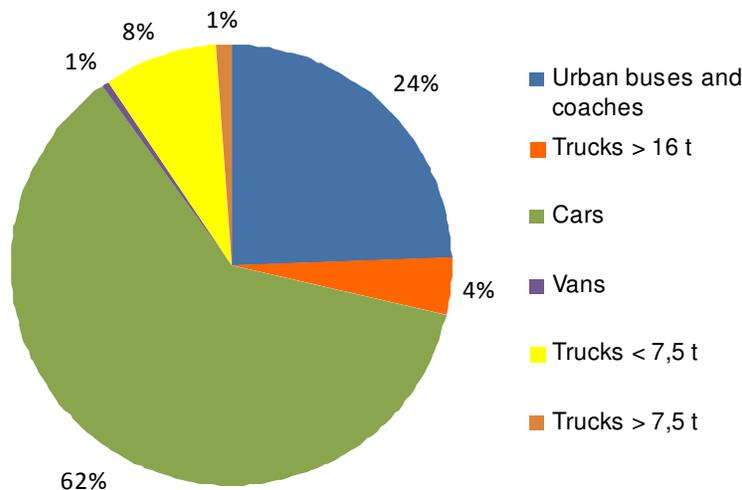


Figure 12: Participating vehicles by type

The high amount of company cars stems from the existing activities of one project partner having closer relationships managing big company fleets. Many companies with larger vehicles have decided to involve a few vehicles into the demonstration in order to test the implementation on smaller scale before extending it to the whole fleet. With test implementation on smaller scale it is possible to avoid some mistakes and imperfections when implementing fuel saving measures on the entire fleet.

One of the main focuses of the RECODRIVE project was the implementation of rewarding and recognition schemes. The majority of the staff included in rewarding was represented by the drivers. Companies having their core business not in the field of transport were less interested to reward their employees on the basis of fuel consumption. Rewarding and recognition schemes are usually implemented in order to stimulate employees to perform better in their everyday work. And in some types of companies, this work is not related to driving.

Fleet managers are rarely included in rewarding and recognition due to the fact that fleet managers are responsible for the implementation of the rewarding and are not in a position to reward themselves. However in our opinion it is rather important that to management would also consider rewarding and recognition schemes for fleet managers that would include rewarding based on total fleet's fuel consumption.

Some demonstrator companies are publicly owned and thus have restricted possibilities of implementing rewarding schemes.

On the other hand, also some privately owned companies have decided against rewarding for various reasons, but all of them taking ECODRIVING serious:

- It was not feasible to objectively ascertain merits for fuel savings among employees therefore the recognition and/or rewarding scheme was not implemented,

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- Energy efficiency behaviour is perceived as liability of all employees and thus additional recognition and rewarding is not appropriate,
- Recognition and/or rewarding could create inequality in the employee's group (e.g. drivers), so the implementation is not perceived as being positive for the working atmosphere.

2.1 Public transport

Public transport has some limitations influencing the fuel consumption:

- Routing depends on predetermined schedules,
- Passengers comfort and safety are essential,
- Maintaining the schedule is a priority,
- Usually several drivers change vehicles and routes within the same week or even day,
- Older fleets are usually not equipped with on-board computers and drivers do not receive instant feedback.

10 public transport companies participated in the demonstration with 268 vehicles.

Country	Company	Number of vehicles monitored	Savings in %
RO	RAT Craiova	4	5.0%
ES	EMT	3	3.4%
SI	Avtobusni promet Murska Sobota	6	2.0%
AT	Bacher Touristik GmbH	50	3.6%
AT	Ebner Reisen GmbH	15	2.9%
AT	Landecker Verkehrsbetriebe	20	15.9%
AT	Ötztaler Verkehrsgesellschaft mbH	30	16.1%
AT	Tyroltours GmbH	25	22.5%
BG	Stolichen Autotransport Plc.	110	7.0%
IT	Larivera SpA	5	3.8%
Total number of vehicles		268	

Table 2: Public transport – RECODRIVE demonstrators

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The following measures were implemented:

- Driver training (theoretical and practical) followed by periodical personal discussions and follow-ups,
- Introduction of fuel consumption monitoring system to the entire vehicle fleet,
- Installation of additional fuel monitoring systems – on-board units enabling precise monitoring of fuel consumption and several other important indicators (RPM, speed, acceleration, deceleration, exhaust brake etc.),
- Improved maintenance (more frequent air filter cleaning, rigorous controls of appropriate tire pressure),
- Workshops for fleet managers, maintenance and procurement staff in order to improve the awareness on importance of managing fuel consumption,
- Company specific recognition and rewarding schemes for the drivers.



Figure 13: Driver training in Slovenia

The high variance of achieved results (up to 22.5%) is caused by a different operational environment (urban vs. rural environment, traffic conditions), cultural environment (different values in different countries), vehicle's specifications (older vehicles vs. new vehicles), different implementation of fuel saving measures and the most important of all – different periods of demonstration and basis for fuel saving calculations. It is safe to say that realistic savings could be more precisely assessed over longer period of time.

Recognition and rewarding measures implemented by demonstrator companies can be grouped into three major fields:

- Recognition for the individual driver in form of public recognition (certificate, award ceremony, awarding title “best driver of the month” etc.),
- Financial rewarding of driver teams (financial benefits calculated per driver team based on achieved fuel consumption in comparison with targeted fuel consumption),
- No recognition or rewarding scheme except for stimulation of driver's pride and professionalism in doing their job the best they can.

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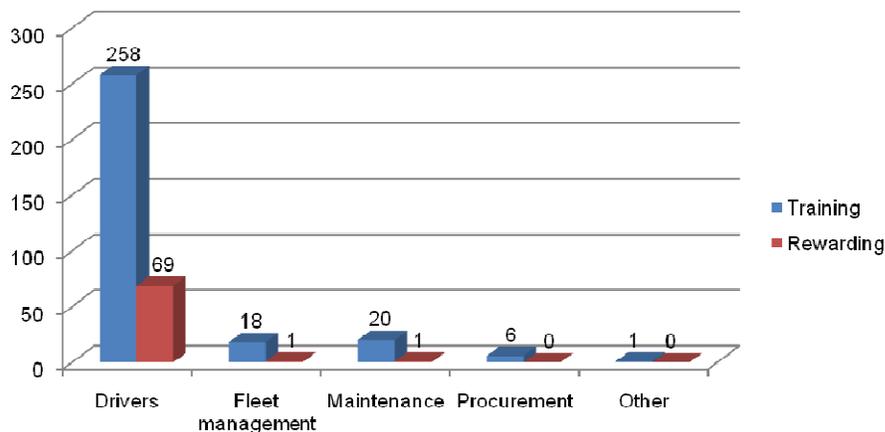


Figure 14: Staff involvement in training and rewarding – public transport

Trained employees were involved in recognition and rewarding schemes. Some companies have decided against implementation of recognition and rewarding scheme due to the fact that they think it is impossible for them to objectively measure individual driver's performance and therefore they are unable to ensure fair and unbiased rewarding. Another important issue was that some of the demonstrator's companies are publicly owned and therefore options for rewarding are very limited and restricted with current legislation.

From

2.2 Long distance freight transport

Like public transport, long distance freight transport has its own unique characteristics and specifics that should be considered with regard to achieved savings:

- Routing depends on availability of the cargo (only some routes are regular – usually routing is done on basis of cargo availability and transport request)
 - Empty runs between unloading and loading of several hundred kilometres are not unusual,
 - Majority of tractors and trailers are well-equipped with aerodynamics aids so there is little room for improvement seen,
 - On-time delivery can be more important than fuel consumption,
 - Fuel consumption monitoring is prevalent practice in freight transport companies,
 - Load characteristics have important influence on fuel consumption that should be taken into account,
 - Transport of liquid and/or refrigerated goods has special requirements (accelerations, decelerations, loading requirements) that might not be in line with eco-driving techniques.
- Recognition schemes work well in public companies where rewarding is not possible,

2 companies with 48 vehicles participated in the demonstration.

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Country	Company	Number of vehicles monitored	Savings in %
GR	Papadopoulos Trans	42	8%
SI	Viator&Vektor Logistika	6	2%

Table 3: Long distance freight transport – RECODRIVE demonstrators

The following measures were implemented:

- Theoretical and practical driver training followed by periodical follow-ups,
- Development of driver's skills through quality circles and brainstorming,
- Workshops for fleet managers in order to improve the awareness on importance of managing fuel consumption.

The difference in the savings (ranging from 2.3% to 8%) could be deriving from the different implementation approach of the companies. While Papadopoulos Trans has opted for quality circles and two-way communication with the drivers, Viator&Vektor has decided for comprehensive driver training performed by external instructors. Another important issue was that Viator&Vektor has retracted customized recognition and rewarding scheme that was developed due to the economic crisis and major organisational and management changes. Additional crucial factor for lower savings at Viator&Vektor was the previously existing system that determines so called normative consumption related to specific vehicle type, load and route. Drivers were already used to take special care on achieving appropriate fuel consumption so the room for improvement was limited.

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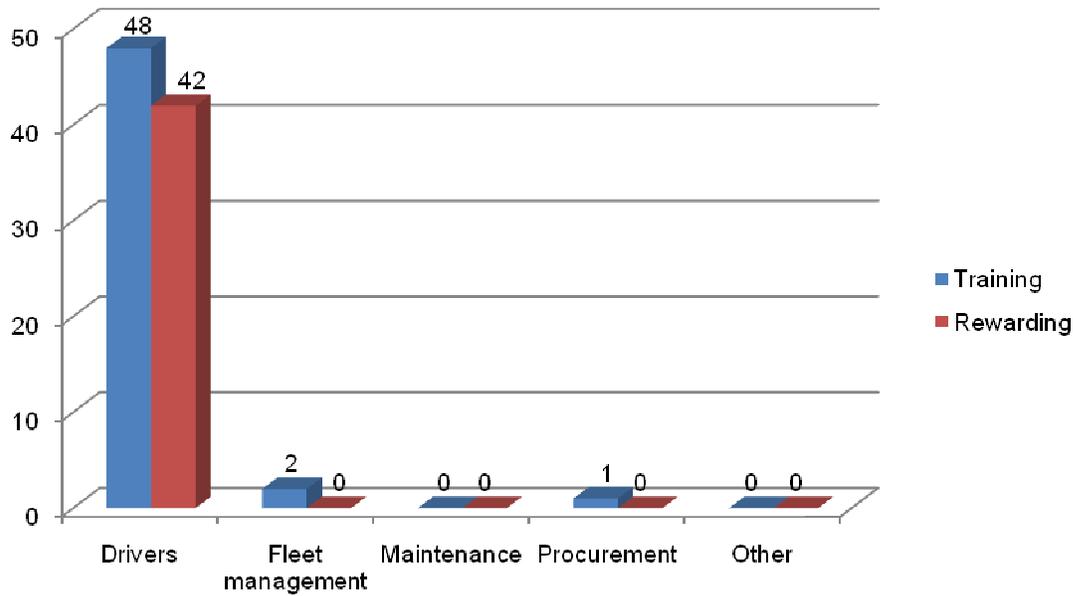


Figure 15: Staff involvement in training and rewarding – long distance freight transport

Maintenance in long-distance freight transport is mainly up to the driver (like checking the tyre pressure etc.) and thus integrated in the driver training. The trucks are inspected when returning from their destinations.

As recognition and rewarding was one of the key components of the RECODRIVE project, it is important to present the involvement in trainings and rewarding schemes.

Recognition and rewarding scheme was only partly applied in Slovenian company Viator&Vektor in form of public recognition (certificate) for the driver even though the complete scheme with financial and nonfinancial rewarding for individual driver as well as driver teams was developed. Due to the substitution of the top management the implementation of recognition and rewarding scheme was postponed.

In Greek company Papadopoulos Trans the rewarding scheme is currently under development. It will be based on individual driver’s achievement taking into account influential factors such as load, seasonality and traffic conditions.

2.3 Utility fleets

For some companies owning and operating vehicle fleets does not represent their core business and these companies are not classified as transport companies. Usually the vehicles are used for enabling employee’s mobility in order to provide certain services to customers, e.g. electrical installations/repairs etc. Fleets can have substantial number of vehicles and sustainable fleet management for these fleets is as important as for fleets in pure transport sector.

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2.3.1 Cars

One of the predominant characteristic of car fleets management is that frequently fuel costs were not considered as a priority. Even though companies are aware that fuel costs are important in most cases it is more important to enable free movement of employees and to have people and tools/appliances on the site on time. This attitude may stem from the time where fuel prices were low. Another significant issue related to vehicle’s specification is closely linked to the image of the employee driving the vehicle or to the image company wants to maintain or achieve. It is quite often that vehicle’s and their engines are oversized and in cases like this fuel consumption is not noteworthy. However this is not the case with cars that are used to transport tools or appliances. With company fleets downsizing the engines is the easiest and most effective way of reducing Total Cost of Ownership.

From field of utility fleets–cars, 4 companies from 2 partner countries participated in the demonstration with 674 vehicles. 670 of those vehicles were from German demonstrators and 4 vehicles were from Norwegian demonstrator.

Country	Company	Number of vehicles monitored	Savings in %
NO	Bergen Municipality	4	6%
DE	BTI Befestigungstechnik GmbH	600	9%
DE	SONY Deutschland	34	5%
DE	Vodafone D2	36	9%

Figure 16: Cars (utility fleets) – RECODRIVE demonstrators

Demonstrators managing utility fleets-cars have implemented the following measures:

- Theoretical and practical driver training followed by periodical feedback on achieved fuel consumption,
- Outsourcing of fleet management to specialized operator managing all issues concerning the vehicles (registration, insurance, fuel consumption monitoring etc.)

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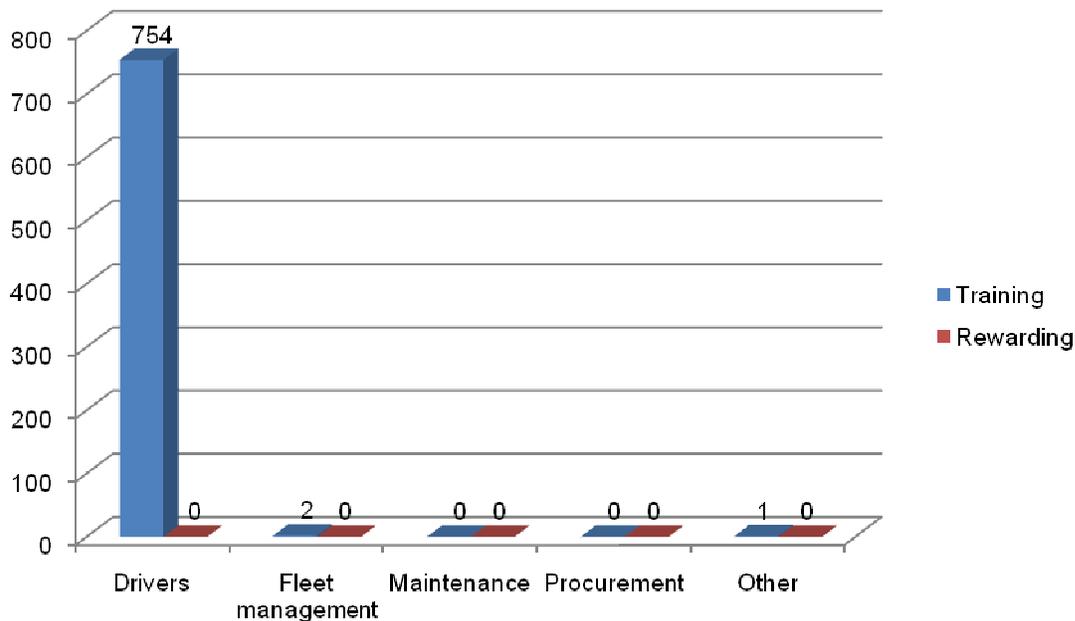


Figure 17: Staff involvement in training and rewarding – cars (utility fleets)

Maintenance and procurement is often outsourced and thus not considered in Figure 17.

Recognition and rewarding schemes were not implemented in the field of utility fleets–cars.

The Norwegian demonstrator's company has found it inappropriate to implement any kind of recognition or rewarding scheme as this is not in line with their culture and social environment. Their employee's motivation derives from pride to be able to participate in the project and from ecological awareness that is an important part of Norwegian culture.

German demonstrator companies have decided to motivate their employees only through detailed periodical feedback for individual driver comprising average fuel consumption per month, personal reference consumption (prior to eco-driving training), average consumption for the last twelve months and achieved fuel and CO₂ savings. It was ascertained that this motivation system leads to an increase of fuel saving success as the motivation derives from aims to save CO₂ emissions. The most important measure was the continuous information to every single driver about his personal behaviour.

2.3.2 Vans

Companies operating fleets comprising vans mainly need this type of vehicles to transport sufficient numerous items/tools/appliances to the different work sites. These types of fleets operate in urban as well as in rural environment. Therefore the vehicles must meet different demands regarding various operations performed.

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The following measures were implemented:

- Theoretical and practical driver training followed by periodical follow-ups,
- Installation of GPS-based route planning system

From the field of utility fleets-vans one company from Norway took part in the demonstration with 7 vehicles.

Country	Company	Number of vehicles monitored	Savings in %
NO	BKK Nett	7	6%

Table 4: Vans (utility fleets) – RECODRIVE demonstrators

The Norwegian company participating in the demonstration could achieve savings of 6% by implementing the above mentioned measures.

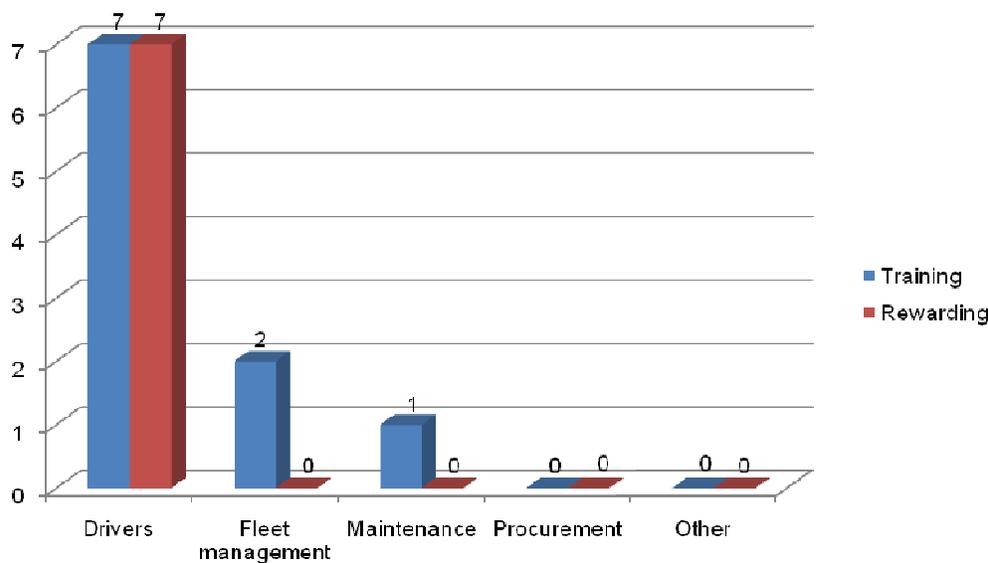


Figure 18: Staff involvement in training and rewarding – vans (utility fleets)

Based on the Norwegian culture a very special rewarding and recognition scheme was implemented. The company rewarded the efforts of the drivers to achieve lower fuel consumption. But: Not only the successful drivers were rewarded, all involved drivers were acknowledged for their efforts.

2.3.3 Trucks < 7.5 tons

Companies operating fleets comprising small trucks use this type of vehicles to transport numerous items from door to door. These types of fleets operate in urban as well in rural

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environment. Therefore the vehicles must meet different demands regarding various operations performed.

From the field of utility fleets-small trucks, one company from Germany participated in the demonstration with 92 vehicles.

Country	Company	Number of vehicles monitored	Savings in %
DE	Deutsche Post AG	92	7%

Table 5: Trucks < 7.5 tons (utility fleets) – RECODRIVE demonstrator

Implementing the measures mentioned below, the German demonstrator could achieve savings of 7%.

The German demonstrator has implemented the following measures:

- Theoretical and practical driver training followed by periodical feedback on achieved fuel consumption,
- Outsourcing of fleet management to specialized operator managing all issues regarding vehicles (registration, insurance, fuel consumption monitoring etc.)

No particular recognition or rewarding scheme was implemented. The demonstrator company has decided to motivate their employees only through detailed periodical feed-back for individual driver comprising average fuel consumption per month, personal reference consumption (prior to eco-driving training), average consumption for the last twelve months and achieved fuel and CO₂ savings.

The motivation of the drivers derives from achieved CO₂ savings as driver's contribution or reduction of environment pollution.

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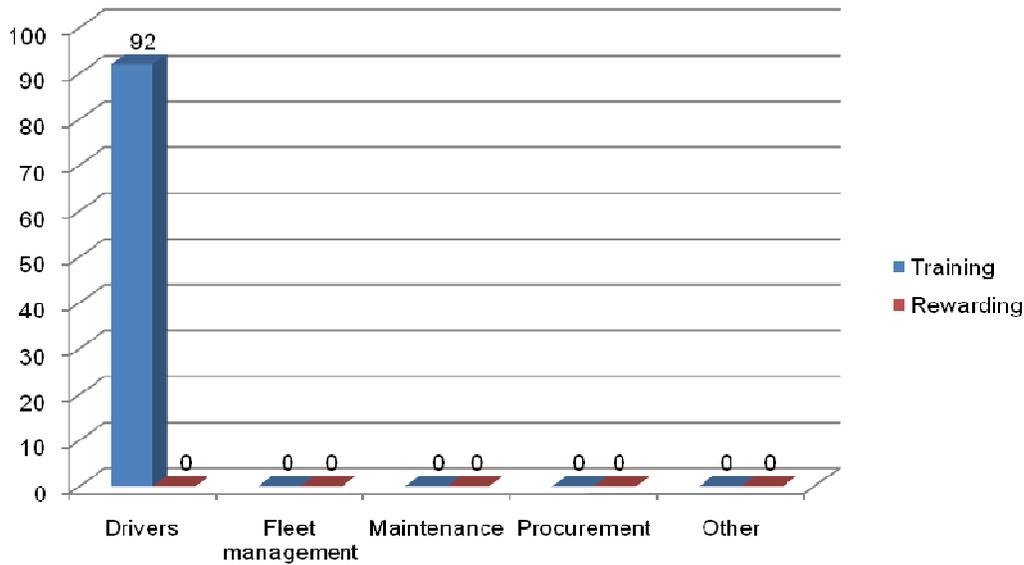


Figure 19: Staff involvement in training and rewarding – trucks<7.5 tons (utility fleets)

2.3.4 Waste collection (trucks > 7.5 tons)

In this operation area some limitations due to the special characteristics are given:

- Vehicles start and stop frequently (the distance between stops ranges from 10 meters in city centre and densely populated areas to 100 meters in suburban areas).
- Idling during the loading and unloading is inevitable with current powertrain technology (the vehicle’s engine supplies the power needed to operate the refuse loading system),
- Heavy vehicles operate in urban areas with heavy traffic as well as in rural areas.

From the field of utility fleets–waste collection, 3 companies from 2 partner countries participated in the demonstration with 11 vehicles (Norway: 5, Slovenia: 6).

Country	Company	Number of vehicles monitored	Savings in %
NO	BIR	5	n.a.
SI	Surovina Radlje ob Dravi	3	1.6%
SI	SNAGA Maribor	3	3.7%

Table 6: Waste collection (utility fleets) – RECODRIVE demonstrators

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The waste collection companies have implemented the following measures:

- Driver training (theoretical and practical) followed by periodical personal discussions and follow-ups,
- Workshops for fleet managers, maintenance and procurement staff in order to improve the awareness on importance of managing fuel consumption,
- Installation of GPS-based route planning system,
- Improved routing,
- Improved maintenance with no noticeable effect.

The achieved savings – up to 3.7% - might sound low, but have to be seen in line with the average consumption per 100 litres, which is up to 65 litres. One part of the vehicles operating in waste collection is the unavoidable idling for loading/unloading with current powertrains. Unfortunately the hybrid powertrains with electric propulsion for the hydraulics are very expensive. The biggest potential for fuel saving in this operation area is the optimisation of the logistics (route but more the bin servicing). It was proven in two participating companies (BIR and Snaga) that it is possible to reduce the number of vehicles for a certain region as a result of route optimisation.

Some recognition and rewarding measures were implemented by demonstrator companies:

- Financial rewarding for the individual driver based on achieved fuel savings,
- No recognition or rewarding scheme except for stimulation of driver’s pride and professionalism in doing their job the best they can.

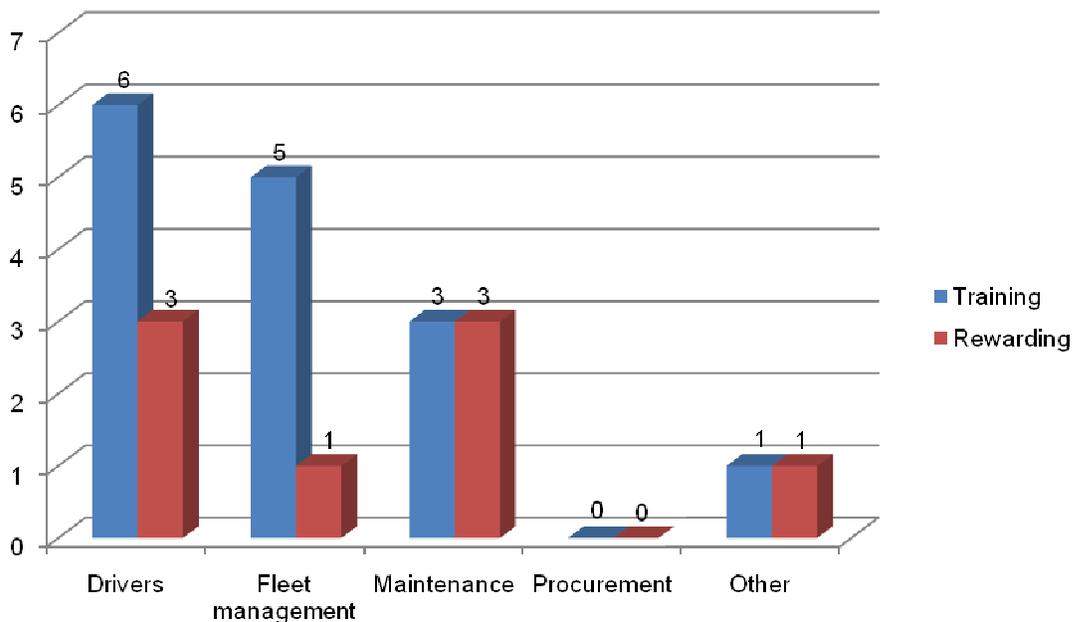


Figure 20: Staff involvement in training and rewarding – waste collection (utility fleets)

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Part of the staff involved in the trainings was involved in the rewarding scheme as well. As some of the companies are publicly owned, options for recognition and rewarding were limited and restricted with legislation. Nevertheless companies did find a way to motivate their employees through financial rewarding or public recognition.

2.4 Implementation Results of the RECODRIVE partners

2.4.1 Rathgeb KEG, Austria

The companies Rathgeb KEG is working with are medium-sized bus and coach companies. Normally there is a boss, one or two persons working in the office, one or two mechanics and the rest is driving staff. So these few people in the office are responsible for all the business going on in the company. Normally they are very busy and do have less time for further projects.

But working on the topic of CO₂ saving needs a lot of time and a lot of commitment. For a long term impact you have to create a project – a project that is not finalised within some months, because there are a lot of factors to be considered.

The first lesson we have learned: Do not try to work on this topic along the way, you need a project plan and you need time for implementation. The best is if the company installs an environmental appointee who is the main responsible person for all environmental topics in the company.

So working on this topic means changing the culture of a company. And this is a hard way.

If you talk to companies in this size about environmental topics they listen to you, but they are not really interested in this topic. If you talk about fuel saving, they have an open ear for you. But we can see that the topic “saving fuel” is not a good motivator for the employees in the company. Installing a “Saving fuel” program normally leads to short time reductions, but it is not possible to create long-term results. Normally this way of working leads to putting pressure on your employees and this is bad and leads to the opposite result.

So the second lesson learned is: It is necessary to combine these two topics.

The third thing to be considered is: From where does the company come? What is their actual culture? Are they already sensitive for topics like this or where they never interested in it? So the starting point changes the way of working and it is impossible to create or find the “only working way”. Working on these topics is a very individual way of working.

Our conclusion is that it is the wrong way to work on single activities and to work with pressure in a company to install saving fuel programs. The right way would be to work on an overall



Figure 21: Austrian bus in operation

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concept with a package of measures and to change the corporate culture on a long term basis being an environmental sensitive company.

The problem that occurs within this way of working is the lacking time and – as we believe – the lacking competence of medium-sized companies. So we believe that most of them would need external help from consultants. Therefore they would need another incentive – also to be ready to invest money into an external consultant. This could be an official “Green-fleet certificate” like an ISO certificate.

So the first step for a company is setting a target:

- What do we intend to reach?
- In which time could we meet our target?

For setting targets a company needs actual data about fuel consumption. We saw that most of them have data from refuelling recordings. But these data only show an overall consumption without any further details. If on a bus is more than one driver these recordings cannot differentiate. Buses are driving different routes with different loadings, so it is not possible to compare these data in an objective way.

So companies need a fuel monitoring system. We worked with the FMS-interface connected with routing data. This is at the moment the ideal way, but still has several problems:

- Older buses do not have the FMS Interface
- Although the producers promise that the FMS Interface works we had a lot of problems installing the systems – this leads to further costs
- You get a lot of data from FMS but the interpretation of these data is very subjective. Especially the data concerning the driving behaviour could be interpreted in several ways. But these data are very useful for further actions.
- The costs of these systems are very high (about 1,000 Euro per bus) so the investment for a company with 30 buses is very high and determents companies

After installing such a system a company needs a period of minimum six months of data recording. We believe that a shorter period leads to inaccurate data and if the basis is not correct, the rest will not be correct. These recordings should be in a period of cold and warm months to see the different consumptions and to consider them in further actions or interpretations of results.

The implementation plan and time schedule is individual, but can contain different activities. We distinguish between hard measures and soft measures in terms of activities.

Hard measures	Soft measures
<ul style="list-style-type: none"> - Procurement - Maintenance - On-board devices - Tire pressure 	<ul style="list-style-type: none"> - Route optimisation - Driver trainings - Trainings for maintenance staff - Rewarding and recognition

Table 7: Different types of measures

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2.4.2 FleetCompany, Germany

In Germany FleetCompany started to search for demonstrators in different types of fleets. Finally the partner companies comprised parcel delivery business, consumer electronics (sales employees), telecommunication (sales employees) and builder's merchant business (sales employees).

In total 92 vans and trucks and 670 passenger cars were involved in the demonstration. These 772 vehicles are driving 3.8 million km per year and consume about 2.3 million litres of fuel per year. The potential of the whole fleets of the German demonstrators are 46,000 vehicles.



Figure 22: Driver gets training in ecodriving

The goal of savings with these partners was a reduction of fuel consumption by 10% through changing driver's behaviour. Therefore the aim was a saving of about 230,000 litres or about 600 tons CO₂ per year.

The implementation ran in five steps:

- 1st step: Definition of fuel consumption reference values for each fleet vehicle or vehicle class
- 2nd step: Calculation of the reference values for individual drivers.
- 3rd step: Define the incentive for the staff/ driver.
- 4th step: Monthly report of the fuel data.
- 5th step: Each driver receives an individual monthly report (consumption, plan / actual difference, CO₂ saving, account balance) by e-mail

Rewarding

Very important for being successful is continuous information to every single driver. Therefore a monthly report was sent to every driver, in which he could see and relate the results of his driving behaviour.

On the first page he sees his average fuel consumption per month, OEM reference consumption, the personal reference consumption (before the start of the project) and his own average consumption over the last twelve months.

On the second page the single data is to be seen, added with fuel saving, CO₂ saving and his financial bonus.

It is impressive that this motivation system leads to an increase of fuel saving success. Therefore it works also if the money system is not offered. In this case motivation derives from reducing CO₂ emissions.

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The most important measure is the continuous information to every single driver about his personal behaviour.

A second amazing effect is decreasing abrasion of rubber and brake pads. This effect can be shown through a longer lasting motivation period (at least one year).

The third effect in motivation results is a decreasing claims rate also for the number of accidents as for the number of damages out of being not carefully.

2.4.3 IDEC, Greece

Operation

The Greek case focused mainly on long distance freight carriers.

The initial and constant demonstrator is the transport company “Papadopoulos Trans”. Papadopoulos Trans is a pure Greek transport company, operating for more than three decades in the road transporting business. It is focused on transport with isothermal foodstuff tank trucks and refrigerated trucks.

Moreover, the company has established to all its trucks GIS systems to be able not only to locate their position, but also to monitor their route and speed.

The company’s most frequent destinations are Greece, United Kingdom, Germany, Austria, France, Italy, Belgium, Holland, Spain, Luxemburg and Switzerland.

Papadopoulos Trans’ top management was very interested in implementing new technologies and management systems in order to eliminate fuel consumption and emissions, not only for economic reasons, but also believing in sustainable development.



Figure 23: Papadopoulos Trans, truck

We have to stress that all 42 vehicles of the company were involved into the monitoring system. We also have to point that the main focus of the training and the rewarding scheme were the drivers. The reason is that maintenance is provided externally and procurement is the management’s decision. In that sense, top management could not be included into the rewarding scheme.

The yearly diesel consumption exceeded 2,000,000 litres per year. The average fuel consumption of the fleet was initially 0.38lt/ km.

The objective in terms of fuel savings was a 10% decline, which would mean a total saving of approximately 200,000 litres of diesel.

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TRAINING

Driver training

The training strategy was the running of quality circles with focus groups. After an introduction to the scope of the new system, the rewards and some ecodriving techniques, a round table discussion was running.

Trainings started on July 2008. The total number of drivers trained was 50, since, as mentioned above a few of the initial ones left the company.

The strategy of quality circles than just tutoring was chosen because, as the management stressed, “Greek drivers prefer to speak more than to listen”. It is also true that most professional drivers are aware of the basics on how to eliminate fuel consumption, but the lack of motivation makes them unconcerned.



Figure 24: Driver training in Greece

Drivers were trained in groups of quality circles and they were announced the rewarding scheme, as the performance motivator.

Management training

The management participated in the trainings, in order to speak, to listen and to motivate. The management (mainly the General manager and owner of the company Mr. Papadopoulos) was actively involved into trainings and quality circles, as, an experienced driver (in the past) himself, had things to learn, to teach and to apply.

Maintenance training

Since maintenance is being provided outside the company, following the manufacturers’ plan, the management assessed that there was no special need for specific training. Tyre pressure monitoring and air filters cleaning were stressed to the drivers, as well as the right adjustment of the aerodynamic spoilers.

Procurement training

Procurement training was also part of the management training. It focused on discussing mainly about the right choice of vehicles.

Route optimisation was not possible due to the nature of cargoes and routes. Aerodynamics had not been applied, except minor adjustments.

REWARDING

Papadopoulos Trans had 2 major benefits in trying to implement a rewarding scheme:

- The vehicles had installed GIS devices and the company could measure easily the distances travelled per trip.

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- The company had been calculated fuel consumption (lt of diesel/ km) since the early '90's.

On the contrary, three issues put the reliability of the data, in terms of comparison, into consideration:

- Truck drivers change companies quite often in Greece. That means that different drivers must be trained on ecodriving techniques
- Not all routes require the same driving style. Greek routes require more fuel and central European routes less
- Even though the gross weight is more or less the same (40 tons), in some cases the trucks deliver goods and return to Greece empty, or leave Greece empty and carry back goods. In those cases, the average fuel consumption per trip differs

After discussion with the management, those alterations were smoothed and a new indicator was born: Average consumption per ton carried. This new indicator is not yet supported by the company's ERP software, but with the synergy of the new GIS system and the ERP, the indicator will be in use soon.

The rewarding scheme was purely monetary and involved the drivers; the basic principle was a 50%-50% sharing of the monetary gains from lower fuel consumption in terms of Euro. The reason for not involving other staff is because the purchasing responsible is the top management, maintenance is not being performed in the company and routing cannot be optimised.

Effects

The first reliable comparable data were generated on September 2009 and the average diesel consumption declined by 8% (approx. 0.35lt/km). The new average consumption level seems to be standardized to this level, but the company's management believes that with the monetary motivation the fuel consumption can decline a little more.

There is no obvious benefit in terms of tires wear, brake wear or maintenance needs and the management stresses that those benefits cannot be extracted from ecodriving or cannot be assessed, for long distance freight carriers.

Finally, Papadopoulos Trans has just proceeded to updating of the GIS system, installed to all trucks. The new system, apart from the monitoring of the vehicles current position globally and of the distance travelled, measures the diesel level in the tanks, calculating average consumption automatically. The new GIS system is operated by Vodafone Greece, in cooperation with Zelitron Co (<http://www.zelitron.net>).

Most of the company's vehicles had installed GIS systems. The economic crisis does not allow the company to invest on new or improved technologies, but from now on there are things the management has in mind.

Lower maintenance costs, decrease of the number of accidents and reduced tyre wear cannot be estimated in short term. The brake pads wear in those vehicles is not significant, since in long distances they brake using alternative systems (e.g. retarder, electric brake).

An increased driver satisfaction could be noticed due to the monetary benefits. The fuel and CO₂ savings imposed positive environmental impacts.

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The original objective was a 10% rate of fuel savings. With the implementation of trainings and with the rewarding scheme, the savings achievement was about 8% up to 2009.

Some drivers were initially sceptic on the project, claiming that this was another way to limit their driving style and profit the company.

Their participation in trainings and the rewarding scheme motivated almost all of them and they seem to be contributing to the aim, even if their only motivator is the rewarding and not the environmental impact.

The most important conclusion from this project was that with easy ways, with minor investments, a company can have multiple gains, in terms of money, green policies, fewer damages and accidents for the vehicles etc, in a win-win base for the management and the drivers.

Training itself is also a gain for the drivers and their relationship with the company.

The expected obstacles were the initial reaction of some drivers on the project.

Another issue to be addressed is that the indicator lt/km cannot be used in accurate comparisons. The reason is that the average consumption is affected by multiple factors, such as the type of the route, the load, the weather, traffic conditions etc. The next challenge is to consider the factor of the load to the indicator.

Gains in fleets, for factors affected by the staff, can be achieved in a win-win basis. Those gains are sustainable and face less negative reactions.

RECODRIVE principles are a step beyond ecodriving techniques, since ecodrive can be a motivator itself only for people that are considered sensitive in environmental issues.

The objective is to find ways to convince or drive people doing things they do not care, using alternative motivators. If those motivators are of no cost, the gain is double.

2.4.4 IVECOL Consult, Bulgaria

The main Bulgarian demonstrator is the Stolichen Autotransport Plc. – Sofia Autobus Company which is the biggest public transport company in the country and covers the main part of the public bus transport in the Capital Municipality of Sofia. The Sofia Autobus Company has 3 branches – Zemliane, Malashevi and Drujba; each of them with independent base for maintenance and services of the buses.



Figure 25: Stolichen Autotransport Plc.

The 80 lines of the buses have a total length of about 1,000 km and the average annual mileage amounts more than 41 million km. The fleet of the Stolichen Autotransport Plc. includes about 650 buses - about 390 dual buses (Mercedes 345G and O505 G, Ikarus 280, MAN SG262, Chavdar 141, etc.) and 260 single buses (Mercedes O302T and

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345G, BNC 220 SLF, MAN SL 200, etc.). These are buses mainly with diesel and 12% diesel-CNG engines, with fuel consumption 22.6 – 51.6 litres/100 km, with more than 200,000 km/year mileage for the new of them, and already 30 years in operation for another. The separation of the buses in the Stolichen Autotransport Plc. of European emission standards for diesel cars after 2000 is shown Figure 26.

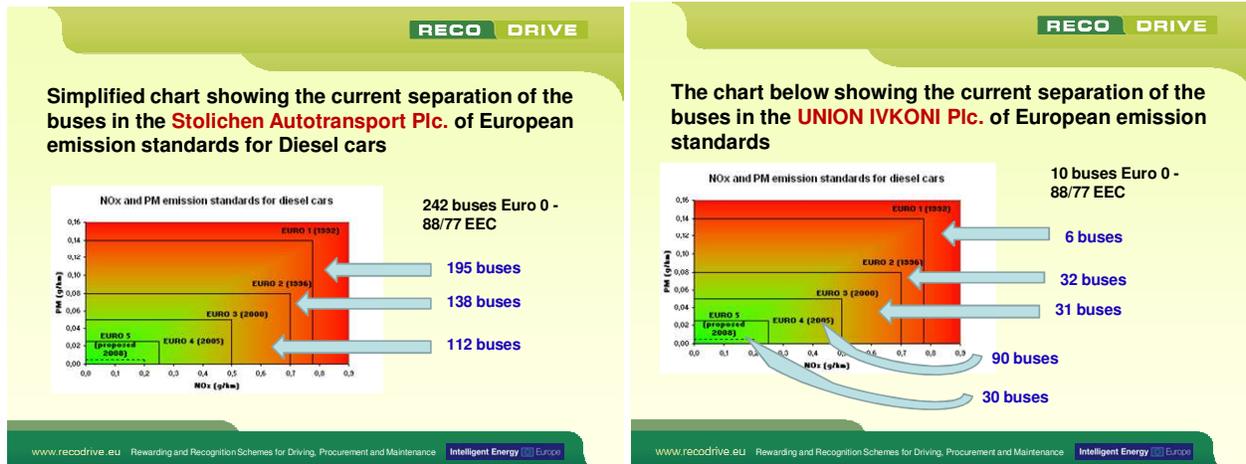


Figure 26: Separation of the buses concerning European emission standards for Stolichen Austotransport Plc. and Union Ivkoni Plc.

The other originally foreseen Bulgarian demonstrator - which was partial involved in the RECODRIVE project (only with conversations with the manager of the fleet and delivery of dissemination RECODRIVE products) - is the Union Ivkoni Plc. The private company was nominated as Bus Company of 2008 in Bulgaria and is one of the most popular Bulgarian Bus Companies which offers daily bus transport to 90 towns in Europe, including Austria, France, Spain, Portugal, Italy, Germany, Belgium, The Netherlands, and also to 60 towns in Bulgaria. The company, established in 1992, is leader in the international bus transportation in Bulgaria and has representations in all countries of Europe and more than 100 offices in Bulgaria.



Figure 27: Buses of the private company Union Ivkoni Plc.

The total average annual mileage is more than 1 million km abroad, 12 million km in the country and 400,000 km city tours. The Union Ivkoni Plc. possesses a fleet of 230 modern buses (incl. 30 EURO5 and 90 EURO4 buses).

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In accordance with the subject of applying training for achievement of energy efficiency improvement and reducing the fuel consumption and green house gas emissions, different interventions were considered in Stolichen Autotransport Plc.:

- For the drivers: Pro-active driving, avoiding harsh breaking and idling, choosing the right gear for efficient operation of the engine, controlled usage of auxiliary devices (entertainment, seat/windshield heating, etc.)
- For the management team - develop of a most suitable rewarding scheme for the staff contributing to the fuel savings, logistic improvement - adapting service quality (frequency/bus size) to the demand, adapting routes to the demand, etc.
- For the maintenance staff – regular tire pressure control, wheel/tire check (tie, camber, caster, twin tire diameters, twin tire kissing, etc); engine check (lube oil, spark plugs, compression ratio, etc.), and periodical check and change of air filter with the aim of achieving:
 - o To train different staff categories in accordance with the purpose of the project
 - o By efficiently and eco-friendly bus/engine operation to save fuel and energy together with decreasing of CO2 emissions
 - o To develop and apply an easy way to implement a financial and social rewarding scheme
 - o To set-up a coherent governance system targeting on energy efficiency issues
 - o Step by step replacing the buses of the fleet by new buses with low motor vehicle emissions and higher EURO category, mainly EURO3 with tendency for EURO4
 - o To find and apply suitable measures for decreasing the influences of the difficulties and obstacles as strenuous work of the drivers in the public transport in the capital, traffic jams, etc.

The training programme at Stolichen Autotransport Plc. concerns the organisation of the training for drivers, management team and maintenance staff under approval of the general manager of the company and responsibility for the implementation of the fleet manager.



Figure 28: RECODRIVE certificate for successful demonstrators

The local version of the training material in Bulgarian and also power point presentations, flyers, folders and fact sheets in Bulgarian versions were prepared.

The monitoring was collecting data for the buses, fuel consumption, mileages, wheels, tires, oil filters, air filters, etc. and keeping the data in a database system. The achieved results allows Stolichen Autotransport Plc. to receive a “green fleet certificate” for fuel consumption reduction and more efficiently and eco-friendly operation.

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The public characteristic of the Stolichen Autotransport Plc. as public transport company which cover the main part of the public bus transport in the Capital of Sofia allows easy spreading of results and effects of the RECODRIVE project demonstration.

The impacts of the project in Bulgaria, thanks to the dissemination of the newsletters, flyers, folders, sticks, etc. could be presented with:

- Creating of preconditions and searching for a better approach for more efficiently and eco-friendly operation of the fleets;
- Stimulation of the companies with “green fleet certificate” received for fuel consumption reduction and more efficiently and eco-friendly operation;
- Application of good practices and sharing of the knowledge and experiences of recognition and rewarding;
- Encouraging the improvement of the routes in the municipality and management of traffic with ensuring the priority of the buses.

In the framework of the RECODRIVE project, some significant barriers and problems were identified, which should be solved on national and local level, as:

- For more of the companies with older fleets there isn't good correspondence of the vehicles with the actual European emission standards EURO3, EURO4... and the efforts for the maintenance of them are too significant. With such vehicles it is difficult to expect efficiently and eco-friendly operation of the fleet.
- The organisation of the work and the management in the fleets are in a lot of cases conservative and there is no good climate, neither conditions nor time for thinking of a sustainable fleet development, innovations, training of the staff, etc.
- Financial status of most companies, particular in the municipality's public transport and also in the SME private companies not allows large application of the financial rewarding schemes. More, but limited applicable are the rewarding schemes for social and operation benefits – holidays increasing, lighter routers, moving of the good drivers to the new and more comfortable buses, etc.
- The infrastructure in the capital and the big towns and municipalities is ensuing to big traffic jams, often accidents, etc. and does not allow nor impede reco-driving
- Some companies are not enough encouraged to implement modern and green-fleet management, route optimization methods, etc.

The ways for solving the problems on national and local level in Bulgaria, could be:

- National legislation improvement in the way of more efficiently and eco-friendly surface transport and specific local regulations in the frame of the municipalities with loaded transport
- Networking of the companies for searching of better company approaches for more efficiently and eco-friendly operation of the fleet, sharing of the knowledge and experiences of rewarding

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- Stimulation of the companies with “green fleet certificate” received for fuel consumption reducing and more efficiently and eco-friendly operation by municipality instruments/tools as reduced companies dues, tax concessions, etc.
- Dissemination of information and application of good practices for fleet reo-management
- Encouraging of the improvement the routes in the municipality and management of traffic with ensuring the priority of the buses
- Coordination and optimization of the net of stations of the automotive transport in the big towns with underground-, railway stations.
- Establishment of training system and implementation of workshops and seminars on different levels for sustainable fleet management and reco-driving for drivers, maintenance staff, fleet managers and top level management
- Consultations on the municipality level policy-makers regarding the EU and national legislations for sustainable fleet management, more efficiently and eco-friendly operation, co-funding search for the purposes related to green-fleet management, etc.

2.4.5 URTP, Romania

Lessons learned by partner URTP and its demonstrator during RECODRIVE implementations

RAT Craiova, the Romanian demonstrator in the RECODRIVE project, applied some measures to reduce fuel consumption in its bus fleet, based on an initial strategy defined within a protocol issued and agreed by its top management.

RAT Craiova is the major public transport operator in Craiova city, functional since 1990 with a fleet of 342 buses and 49 trams operated by 2,900 employees.

Nowadays, RAT Craiova staff is of 894 employees, of which 460 bus drivers and 80 tram drivers. They are currently driving 188 buses and 22 trams in a public transport network defined by about 19km tram tracks with 52 stops and 147km bus lanes with 208 stops, annually carrying out more than 65 millions passengers of which 24 by tram.

Among the most relevant features of their public transport network:

- Commercial speed is in average 12km/hr for trams and 16km/hr for buses
- Headways are of about 4 minutes for trams and 7 minutes for buses
- Operational costs indicator is 0.11 Euro/passenger and 0.53 Euro/km.

Most buses are endowed with EURO2 and 3 engines.

The newest 17 buses, MAN Lyon City, operational starting with November 2008, are endowed with EURO4 engines and on board devices for fuel consumption monitoring, of which 4 buses were monitored and tested in RECODRIVE project.

RAT Craiova tasks in RECODRIVE initiative were to:

- Test some measures in order to improve fleet management and its energy efficiency
- Test some rewarding and recognition schemes and
- Save more than 10% fuel savings.

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Two bus lines were selected to be monitored:

- Line 6, covering a 100% urban area and
- Line 9 going out of the city and covering only 50% urban area.

For each line two MAN Lyon City buses were monitored:

- No. 438 and 446 on line 6 (a total of 12 MAN buses running on this line)
- No. 443 and 449 on line 9 (a total of 3 MAN buses running on this line)

Training courses

Drivers training

Drivers training course was preceded by a period of 6 month (November 2008 – April 2009) during which fuel consumptions and driving style in different technical conditions (traffic, loadings) were monitored.

The training course at RAT Craiova was performed in May 2009 mainly for the 12 drivers of the 4 monitored buses, but also with the participation of the management body and representatives of bus providers.

The 2nd round of training was a practical action, lasting from May to October 2009. It consisted in drivers monitoring with trainer's remarks (on board and under different traffic conditions). Fuel consumptions were monitored with different measures implementation.

In October 2009 the final training seminar took place, with the evaluation of the results, including staff rewarding.



Figure 29: Driver training in Romania

Management training

Two managers and a Head from Bus lines Department operation attended this training of RAT Craiova staff.

Maintenance training

The following technical measures were tested:

- The 2 buses on line 6 were replaced with the 2 buses on line 9 for a six months duration
- Air filter cleaning, half the interval recommended by the provider, for the 2 buses monitored on line 6
- Fuel consumption was monitored both at peak hours and with a minimal loading (passengers) mainly during week ends
- Fuel consumption was monitored at different tire pressures, comparing with nominal values.

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Procurement training

There was no procurement training at RAT Craiova as the new monitored buses became operational in November 2008.

Rewarding schemes

The rewarding scheme approved for RAT Craiova drivers was a monetary one whose provisions were the following:

- 4 points granted for each saved litre of diesel
- The value of each point was fixed for 0.50 Lei which is about 0.10 Euro
- The reward should be granted to those driver teams who register at least 1,800 points

The tested monetary rewarding scheme proved to be of a lower success than expected. It gave other drivers the feeling of being less appreciated even if they invested an almost equal endeavor to save fuel as well. That is why RAT Craiova top management decided within the final meeting in Craiova (October 2009) to reward the best team for each of the two monitored/tested bus lines as follows:

- Line 9 – drivers team on bus no. 443 managed to register 1800 points and it was rewarded according to the Protocol provisions
- Line 6 – drivers team on bus no. 446 managed to register 1,000 points and the rewarding amount was accordingly calculated (lower than the other rewarded team on line 9)

Other stimulating schemes will be further on tested by this demonstrator.

Effects of URTP actions

The 12 trained drivers increased their awareness on the importance of an eco driving behaviour. A ‘defensive and preventive’ driving combined with a rational driving and a good knowledge on vehicle’s features are the key issues for an energy efficient driving.

Fuel consumption and CO₂ emissions were reduced even with new EURO4 engines buses:

- 2.47% following the training of the 12 drivers improving their awareness on the importance of an eco-driving behaviour. A ‘defensive and preventive’ driving, combined with a rational driving and a good knowledge on vehicle’s features, are the key issues for an energy efficient (eco) driving
- 1.30% based on the results of some specific maintenance implemented measures even with new EURO4 engine buses
- 1.6% reconsidering line 9 routing, leading to a 100% linear bus corridor

A more comprehensive database and the approach of the tests results analyze are of considerable support for a periodical energy strategy reconsideration.



Figure 30: Handing out a certificate

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A further extension of some measures to the whole bus fleet might lead to about 5% fuel savings, resulting financial savings of operational costs with about 100,000 Euro/year.

11 followers from Romania proved to be concerned with RECODRIVE topic. They received a Follower Certificate. Following RECODRIVE dissemination, more than 882 tons diesel/year and 2,658 tons CO₂/year will be saved by these 11 PT operators from Romania starting with 2010.

The national seminar organised by URTP in November 2009, gave participants the opportunity to answer a questionnaire whose conclusions are:

- Almost 50% appreciated technical and economic information received as very good and 50% as good
- Only 25% considered financial info as very interesting while 75% as good and satisfactory
- More than 70% appreciated RECODRIVE aims and novelty as very interesting
- Fleet management and staff trainings are considered of major importance among ecodriving measures, followed by acquisition, alternative propulsion, rewarding schemes, on board devices, best practices in Europe, etc.
- Current legislation in Romania is equally considered as a barrier and an opportunity in promoting fuel saving measures
- 80% considered technical issues, including market offer, and trainings as an opportunity in promoting fuel savings and ecodriving measures
- Monetary rewarding schemes did not seem to be agreed by most public transport operators

2.4.6 Trasporti e Territorio, Italy

Operation

The Italian company LARIVERA has joined the RECODRIVE project to evaluate the benefits of a rewarding scheme based on eco-driving and green fleet management techniques.

LARIVERA SpA is a privately-owned bus company of Campobasso in the Molise Region in Italy. LARIVERA runs both regional and local public transport services, including the urban public transport (PT) network of Campobasso and Termoli. It also operates national coach links, school services and offers coach hire with driver services.

With the objective of significantly reduce fuel consumption and pollutant emissions of the entire fleet, the Termoli-Rome link was chosen to design and test a tailored RECODRIVE scheme.

Termoli (3,000 inhabitants) is a municipality on the Adriatic coast of Italy in the central region of Molise. Every day the city is connected to Rome by a regular coach service which covers the distance of 300 in 3h30min. The service is operated by the local public transport operator LARIVERA SpA which also manages the regional bus network with a fleet of over 100 buses.

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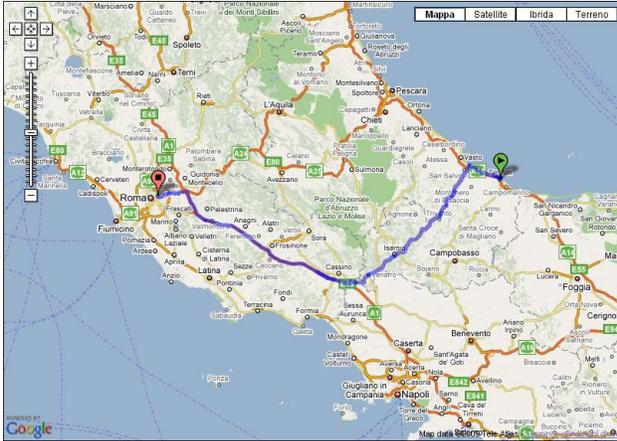


Figure 31: Route Termoli-Rome

3h30min. The coach link is serviced by a fleet of 4 GT coaches and 6 drivers grouped in 3 different teams.

The monitored fleet comprised:

- Nr. 2 Setra EURO4 HD Comfortclass (S415GT and S416GT),
- Nr. 1 Irisbus Domino EURO3 coach,
- Nr. 1 Setra S431GT double-decker (EURO5) mainly used for peak journeys.

Over 500,000 km are travelled per year with at least 170,000 litres of diesel consumed on the service Termoli-Rome-Termoli.

Before the implementation of training and rewarding scheme simple fuel consumption monitoring was introduced. It was based on simple manual paper registration of kilometres travelled and litres filled-in at the refuelling. Manually gathered data were then inserted into simple MS-Excel tool developed specifically for this purpose. The tool enabled registration of data from all refuelling operations as well as data on the driver team assigned to individual vehicle on a daily basis. It was essential to set-up a database enabling clear correlation between driver team and fuel consumption in a specific time period. It was the basis for the implementation of a rewarding scheme.

Driver training

Drivers have been trained on eco-driving principles and techniques in two phases:

- Drivers briefing on the project objectives, the overall idea of fuel efficiency and environmental benefits to be supported and enforced by a rewarding scheme,
- Full day of eco-driving training (theoretical & practical lessons) was organised and carried out by TRT and the safe and eco-driving instructor from the school GuidarePilotare.

With just one “coast-to-coast” motorway corridor in central Italy crossing the Appenine Mountains (i.e. the A25-A24 link from Pescara to Rome), all other itineraries have to be travelled at high altitudes on national roads. Local communities of the Molise region near the Trigno river are therefore connected to the capital by coach along the road SS650 (the maximum altitude is 916 m) and the A1 motorway by a tollgate in between Naples and Rome.

Regular service between Termoli and Rome is serviced by 2 departures daily covering 300 km distance with 13 intermediate stops in

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Management training

The training sessions for managers (board of directors and fleet manager) was focused on the following relevant topics:

- Green vehicle procurement,
- Fuel monitoring devices on buses, fuel monitoring systems,
- Energy savings and emissions abatement as part of a communication strategy.

Maintenance training

The maintenance unit was fundamental for the project activities: in the first steps most of the vehicle related aspects and technologies to be monitored and evaluated were disclosed by the maintenance manager. There were many positive feedbacks between the TRT and the maintenance unit in order to summarise and produce a tailored manual.

Procurement training

Vehicle procurement, procurement of tires and spare parts as well as procurement of several products and solutions were analysed together with the maintenance unit. Joint conclusions should enable procurement better suited to company's needs.

Rewarding & Recognition Scheme

The company decided to apply a financial rewarding scheme for driver teams with regard to the individual vehicle's fuel consumption in correlation with driver team.

Calculations of the fuel consumption were done on a monthly basis. The targeted fuel consumption (in terms of optimal fuel consumption) was fixed at the beginning of each monitoring period (month), taking into account several aspects that could produce over or underestimation of the achievable fuel consumption (seasonal aspects, weather conditions, passenger flows, drivers turnover, traffic conditions, etc.)

Based also on the average fuel consumption and the difference between the best and the worst performance of the previous month, targeted fuel consumption for the month in question was fixed.



Figure 32: Larivera's RECODRIVE drivers

Targeted fuel consumption was then compared to actual fuel consumption between each refuelling operation. If savings for individual fuelling were ascertained, all litres saved were converted into monetary value by applying 50% of the average diesel price at fuel pump (available through official Italian statistics). The scheme also incorporate penalties: If the actual fuel consumption is higher than targeted consumption, litres wasted are converted into monetary value and deducted from total savings achieved. The final bonus for drivers therefore results from the sum of positive and negative performances.

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apr-09															
TARGA	Team 1	Team 2	Team 3	DATE	DAYS	LITRES	Dashboard	Valid litres	KM driven	Consumption in KM/LT	Litres saved/lost vs target	Total Bonus €	Bonus to Team 1	Bonus to Team 2	Bonus to Team 3
DG 324 DL	1			02-apr	1	309	281946								
DG 324 DL		1		03-apr	1	171	282605	171	659	3,9	7,11	€ 7,43	€ -	€ 7,43	€ -
DG 324 DL	1	1	1	06-apr	3	203,9	283415	203,9	810	4,0	15,02	€ 15,70	€ 5,23	€ 5,23	€ 5,23
DG 324 DL			1	07-apr	1	273	284375	273	960	3,5	-13,54				
DG 324 DL		1		08-apr	1	125	284936	125	561	4,5	26,62	€ 27,83	€ -	€ 27,83	€ -
DG 324 DL	1			09-apr	1	152	285504	152	568	3,7	1,51	€ 1,58	€ 1,58	€ -	€ -
DG 324 DL		1		10-apr	1	143	286061	143	557	3,9	7,54	€ 7,88	€ -	€ 7,88	€ -
DG 324 DL	1			11-apr	1	147	286617	147	556	3,8	3,27	€ 3,42	€ 3,42	€ -	€ -
DG 324 DL	1	1	1	14-apr	3	148	287171	148	554	3,7	1,73	€ 1,81	€ 0,60	€ 0,60	€ 0,60
DG 324 DL		1	1	16-apr	2	303	288295	303	1124	3,7	0,78	€ 0,82	€ -	€ 0,41	€ 0,41
DG 324 DL	1	1		18-apr	2	315	289495	315	1200	3,8	9,32	€ 9,75	€ 4,87	€ 4,87	€ -
DG 324 DL		1	1	20-apr	2	60	289708	60	213	3,6	-2,43				
DG 324 DL			1	21-apr	1	329	290918	329	1210	3,7	-1,97				
DG 324 DL	1	1		23-apr	2	345	292120	345	1202	3,5	-20,14				
DG 324 DL	2	1	1	27-apr	4	283,9	293166	283,9	1046	3,7	-1,20				
DG 324 DL		1		27-apr	1	194	293768	194	602	3,1	-31,30				
DG 324 DL	1		1	29-apr	2	329	294968	329	1200	3,6	-4,68				
DG 324 DL	1			30-apr	1	187	295621	187	653	3,5	-10,51				
	11	11	8		30	4017,8		3708,8	13675		-12,85	€ 76,21	€ 15,71	€ 54,26	€ 6,25
													€ 7,85	€ 27,13	€ 3,12

Total km driven	13675	Fuel consumption	min	4,5
Total fuel consumption (litres)	4017,8	Fuel consumption	max	3,1
Avg FC in km/l	3,40		diff.	45%
Total km driven (valid)	13675	Weighted FC	km/l	3,7
Total fuel consumption (valid litres)	3708,8	Target	km/l	3,7
Avg FC in km/l	3,69			
Avg diesel price in €/litro	1,04525			

Table 8: LARIVERA calculations

The total fuel cost reduction achieved per team is therefore equally divided between company and the team in question. Half of the average diesel price multiplied by the saved litres represents the monetary bonus that is awarded to the driver team and then divided equally between the 2 drivers. The other half of the monetary saving is awarded to the company as real reduction of fuel costs. Financial rewarding was positively accepted by the involved employees.

The scheme is quite conservative, but clearly creates benefits for the company as well as for drivers.

Effects

The project demonstration has established complete fuel monitoring system for the fleet. Despite its very simple approach it was demonstrated that also with a few data and/or with incomplete refuelling data it is possible to implement a proper rewarding scheme. However the consolidation and analysis of refuelling data has proven quite demanding. Due to incompleteness in registrations or partial refuelling, some “outliers” values had to be cancelled from the scheme. This clearly means that paper based registrations should be substituted with e-cards facilities and a proper software.

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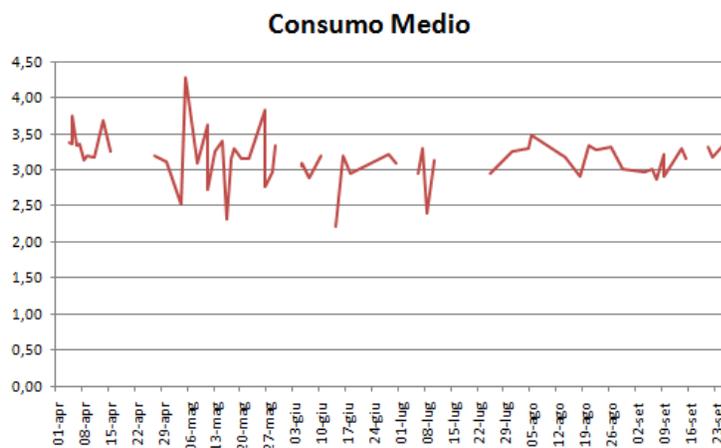
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Nevertheless results have been well above the company expectations of saving at least 7,000 litres of fuel per year (around 5% of the total annual consumption). It has been demonstrated that during the 6 months of monitoring activities the final fuel consumption result was on average 3.8% better than the targeted fuel consumption. If we consider savings against worse or not rewarded performances, real savings are also higher.

Two levels of fuel savings were identified:

- Savings in terms of variance between a “normal or bad” driving style and the target (which are difficult to be correctly calculated);
- Savings in terms of variance between the target FC and obtained or “real” FC.



Looking at historical figures related to the first acquisition and weekly consumptions of the materials, the procurement department has adapted the overall strategy by introducing several elements of evaluation for the purchased products mostly based on green procurement concepts (e.g. fuel economy indicator on the dashboard). Current fleet management procedures from the ISO9001 manual (e.g. type and timing of regular checks) have been calibrated against different energy efficient schemes.

Table 9: Average consumption

The rewarding and recognition scheme has also a positive side effect on vehicles: Less fluctuations and more stabilised fuel consumption performances, which means benefits also in terms of vehicle’s maintenance;

2.4.7 Western Norway Research Institute, Norway

In Norway, the RECODRIVE project has contributed to large potential fuel savings beyond the project period. Three demonstrators have taken part in the project, all of them being public bodies: Bergen municipality with its fleet of maintenance cars; Bergen Inter-municipal power company (BKK), also with maintenance cars; and Bergen Inter-municipal renovation company (BIR) with waste-handling trucks. These three bodies have gained valuable experience regarding how to reduce fuel consumption, and in the benefits of sharing experiences, learning from each other and cooperate for instance on procurement. Several participants have described the participation in RECODRIVE as an “eye-opener” and an inspiration to continue to work and cooperate on these issues.

One important point to bear in mind here, is that the three demonstrators are just a few out of a large number of Norwegian municipalities and public utilities services. These bodies

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communicate and cooperate actively with similar bodies all over the country. In this way, a municipality or a publically owned company has a large potential for acting as a role model for others. When participators in RECODRIVE feel that they have gained valuable experience from the project, and signalize that they will continue and extend their work for reducing fuel consumption in important parts of their fleet management, they are likely to communicate the benefits of having such a focus to other municipalities and publically owned companies in Norway.

The short-term fuel savings have not been satisfying, achieving 4-5% savings at maximum. The real impacts, however, is somewhat complicated to assess and must be seen in a long-term perspective. We will have to wait some years in order to fully see to what degree the project has had an impact on the demonstrators and possibly other public bodies inspired by them. It is also important to keep in mind that this project addresses institutional learning, changes in the philosophy of fleet management, and knowledge about fuel savings, factors of which it is not always possible to measure the effect. For this kind of impacts, we can only assume the degree of which RECODRIVE has contributed, along with other impulses. We are still convinced that RECODRIVE has had a positive effect on our demonstrators.

Public bodies need time to improve their fleet management, since they are to a large extent following long-term plans for public spending and long-term contracts with external suppliers such as leasing companies. Extensive changes need political support and must in many cases wait until plans are reviewed. Public bodies are working for the public good, and have an intrinsic interest in implementing measures for reducing their environmental impact; thus they are often interested in doing extensive actions to improve their environmental record. They do, however, generally need more time for doing this than a private company.

During the project period, we have also discovered some barriers in publically owned companies for implementing extensive fuel saving measures. Investing in new equipment is sometimes expensive, for instance the procurement of hybrid-electric special vehicles. This may increase the cost of a public service, and sometimes there is a fear (probably correct) that sending a higher bill to municipalities may lead politicians to question the efficiency of the service. This may in turn lead politicians to open up for more competition, lowering the environmental requirements, so that less environmentally friendly companies offering the service at a lower cost win the tender. Such discoveries call for patience and long-time work: If extensive change is to happen, politicians have to see the benefits of reducing energy consumption in vehicles and play along. If they do, however, the potential in a public company for saving fuel might be higher than in a private company, because they do not have the same requirement to earn money.

Demonstrator 1: Bergen municipality

Bergen municipality has an extensive plan for reducing climate gas emissions from their fleet, and has participated in the RECODRIVE project in order to look systematically for the most efficient strategies to reach this goal. In addition, they attended the project along with the two other demonstrators, BKK and BIR, in order to cooperate better with them on climate gas emissions reductions. During the project period, they did some important discoveries.

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Bergen municipality covers the city of Bergen, the second largest city of Norway with around 250,000 inhabitants. Reducing climate gas emissions from the transport sector is very important to Bergen municipality. More than 50% of the climate gas emissions in Bergen are coming from road transport, and local air pollution is also a major problem. With its 700 vehicles the municipality itself is contributing to these emissions, and in 2007 the municipality stated that its goal is to reduce the emissions with 50% before 2015. The municipality's participation in the RECODRIVE project is one of the actions taken in order to fulfil this goal.

The municipality decided to participate in the RECODRIVE project mainly with four of their cars with one driver each, all belonging to the building maintenance section of the city administration. The municipality focused on these four cars and drivers in order to explore in depth how to reduce fuel consumption in the municipality's own car fleet, and the vehicles were chosen because their fuel consumption is easy to measure. The results will in turn influence the management of the municipality's approximately 700 vehicles. In addition, the municipality was, and is constantly, focusing on a series of other aspects of their fleet management. For instance, they are working on reducing the number of vehicles in their fleet, and how to enable more employees to share cars. Further, the municipality has a procurement policy focusing on emissions, where a stated goal is to buy as small vehicles as possible with the lowest possible emissions. They have also given driver training to 40 of their nurses in the community nursing section, where it for structural reasons is difficult to measure the results.

Bergen municipality's measurable results in the project period come from the five cars in the building maintenance section. In autumn 2009, all drivers were trained in eco-driving. The fuel consumption was measured before, during, and after the training. The objective was a 5% reduction of the fuel consumption.

The goal of 5% reduction was met. In the control period after the driver training, three out of the four drivers saved 11%, 9%, and 5% respectively. The last driver actually used 4% more fuel in the control period. However, the control period was rather short, and right after the driver training a long period of unusually cold weather began. The driver, who used more fuel in the control period than before the driver training, had an older vehicle than the other drivers. The municipality therefore sees the results as expected considering the weather conditions, and believe that the savings would have been bigger if the weather was more fortunate. The results are therefore very uplifting. The municipality will continue to measure the fuel consumption from these four cars in order to see if the savings continue.

To conclude, the municipality discovered a very promising saving potential in the composition of the fleet, and will continue to focus on procuring fuel efficient vehicles that are as fuel efficient as possible. Measures like ecodriving and route planning are also promising. One very important result of the project period is that the municipality has developed their system for measuring fuel consumption. This is an important prerequisite for finding efficient fuel saving measures.

Demonstrator 2: BKK

Bergen Inter-municipal power company (BKK) joined the RECODRIVE project mainly for the same reasons as Bergen municipality: To learn more about strategies to reduce emissions from

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their own fleet, and in order to cooperate more closely on the issue with the two other demonstrators. They soon found out where their highest potential for fuel saving is: In logistics and route planning.

BKK has participated with a section of the company that has a high mileage, BKK Nett, which has the responsibility of securing a safe and stable distribution of electrical power to 177,000 homes, companies, and public buildings in Western Norway. Their main activities are to plan, build, run, and maintain the power transport system. In the RECODRIVE project, BKK Nett focuses on staff driving long distances in order to maintain the power grids.

Seven employees with one car each volunteered to participate and function as showcases for the entire fleet. The results of their participation in the RECODRIVE project will influence the entire fleet management of BKK. The drivers were given training in eco-driving, and their fuel consumption was measured before and after the training. Their goal in his first round has been saving 5%. The maintenance of the cars is already good, and all of them are small vans, so putting an extra emphasis on maintenance was not regarded as an important measure this time. Route planning, on the other hand, soon stood out as an area with an especially large saving potential.

Thus, BKK has put special emphasis on evaluating their route planning, and among other things they are purchasing a GPS-based route planning system. The management now has a constant focus on this issue, and is inspired by the work done in RECODRIVE, but due to the fact that BKK is a large public service provider, all large purchases and changes take time. Therefore, it will still take some time to see the fuel saving results of the improved route planning.

The measurable results in the project period, therefore, are the results of the driver training. The results are at first glance rather disappointing and a little surprising. There was actually no reduction in fuel consumption in the period after the driver training, compared to the period before the training. Cold weather could be part of the explanation (but not all); another explanation could be that the drivers change routes frequently, so that they might have had more fuel consuming routes in the control period than before. BKK will continue to measure to consumption in order to learn more about fuel consumption throughout the year.

BKK still has faith in eco-driving training, and will go on implementing it in a larger scale. In 2010, 50 new drivers will be trained. Fuel saving is only one argument for doing drivers training in BKK. Another strong argument is that eco-driving leads to a reduction of accidents and maintenance costs. Therefore, the company believes that eco-driving will help them reduce costs and become more environmental friendly.

Demonstrator 3: BIR

BIR also joined RECODRIVE in order to learn more about reducing greenhouse gas emissions from their fleet, in cooperation with Bergen municipality and BIR. Due to the nature of their fleet, largely consisting of large garbage collecting trucks, they found that their most important saving potential lies in route optimisation.

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BIR is the second largest renovation company in Norway, serving approximately 320,000 inhabitants. In the RECODRIVE project, BIR is focusing on five waste collecting vehicles with two drivers each. These function as pilots. The trucks are among the newest vehicles in the fleet. BIR has considered fuel saving measures in all parts of the fleet management, and concluded that for them, route planning has the largest potential for savings. They have purchased, and are about to implement systematically, the GPS-based route planning system Spider. They are currently testing and implementing the system, and based on the tests they believe that they will save many kilometres of driving and that they would need at least one truck less. BIR has also been working on maintenance, and tested if fuel consumption decreases by introducing new maintenance measures. Somewhat surprisingly, the results didn't show any savings from the measures implemented. For driver training, on the contrary, they believe that the results of eco-driving would be very limited, since most of the energy used in the vehicles is used for compacting garbage. Due to difficult economic situation they have not prioritise driver training this time, but they hope to implement it in the future.

As a public service provider, BIR has met some important obstacles for implementing fuel saving measures. Publically owned companies like this are vulnerable to a shifting political climate, where it is regarded as important to deliver services at a low economic cost. Therefore, the company sees challenges related to implementing measures that could save fuel but need some investment. Eco-driving is one example, buying more expensive but more energy efficient hybrid-electric trucks is another. As long as more environmental friendly vehicles, such as a hybrid electric garbage collecting trucks, are a lot more expensive than other trucks, there is a risk for BIR that purchasing such equipment would make their services so much more expensive that politicians would open up for more competition with lower environmental standards in order to reduce the costs. The result could be that a company that deliver a less environmentally friendly service to a lower cost wins the tender. Larger investments thus need political support.

Though BIR cannot demonstrate any fuel savings in a short run, RECODRIVE has helped them putting fuel savings on the agenda. They have been able to discuss new ways of reducing fuel consumption, and not the least exchange experiences and information with the other demonstrators.

Main impacts from RECODRIVE – Norway

The RECODRIVE project has contributed to the municipal policies in Bergen, of reducing emissions from transport in general, and particularly from public fleets. Three demonstrators have benefited from discussing with each other during the project period, and receiving more information on how to save fuel. They have shared experiences and found several ways of cooperating closer for better results in the future - doing procurement together is an example. Overall, actors who have participated in the project call it an “eye-opener” and say that they have got new insight in fuel savings.

Bergen is the second largest city in Norway, and it cooperates with a number of larger and smaller municipalities in the country. For instance, Bergen municipality takes part in the Cities of the Future project, an environment project for the 13 largest cities in the country. The municipalities share good experiences on environmental measures, and good examples of how to

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reduce fuel consumption is likely to be shared with a number of other municipalities, garbage collecting companies and power companies.

So far, none of the demonstrators have tried rewarding and recognition schemes for their employees as a measure to save fuel. The main reason is that rewards are largely seen as a measure breaking with Norwegian company culture, especially in the public sector. Monetary rewards are out of question, but they are considering other kinds of recognitions, such as a lottery where some of those participating in fuel saving activities win a prize. This is an incentive to participate. This illustrates that it is very important to adapt such scheme to the local context.

2.4.8 BESEL, Spain

The most interesting results achieved in Spain with project partner's participation are related with the study and implementation of different kind of initiatives together with the demonstrator and the support to other fleets to join the RECODRIVE project as follower. This has led to significant impacts in terms of fuel savings and reduction of CO₂ emissions in Spain, as well as excellent examples to be followed by other fleets.

The Municipal Transport Company of Madrid (E.M.T.) has implemented a demonstration of RECODRIVE project measures with the support of Spanish project partner BESEL, in order to evaluate the benefits obtained in terms of energy saving and reduction of greenhouse gas emissions.

Madrid EMT is the institution that provides the regular group transport service in the Madrid municipal terminal. It has a staff of about 7,500 employees (5,500 drivers) and 209 lines in service, with a fleet of buses of 2,062 units in 2009:

Diesel	-
Biodiesel	1,664
CNG (Compressed Natural Gas)	380
Hybrid (Biodiesel/Electric)	12
Hydrogen	-
Ethanol	5
Electric	20

Table 10: Fuel types used by EMT Madrid

Efficient use of vehicles has been also an important aspect for them. Since 2007 ecodriving courses for drivers have been implemented in EMT Madrid. In June 2009 more than 50% of drivers (3,159) had been trained within these courses, showing savings about 15% of fuel consumption. These courses are carrying on nowadays and all drivers (100%) will have received this training next years.

RECODRIVE partner has motivated in EMT Madrid the study of further initiatives to reduce fuel consumption and CO₂ emissions in addition to the ecodriving training and the use of alternative fuels and vehicles. This study includes the implementation of recognition schemes for fuel-

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efficient drivers and staff, the use of on-board devices for vehicles or the efficient maintenance of the fleet, among others.

In particular, EMT Madrid has tested some measures considering three bus lines in the RECODRIVE demonstration. Three new buses have been used for the demonstration, so three driver teams have been involved with two drivers in each team.



Figure 33: Buses of EMT Madrid

After a previous test phase in order to evaluate the actual fuel consumption and performance of these three buses, a training workshop was organised by EMT and BESEL on July 2009. Then the drivers were informed about the RECODRIVE project, including ecodriving concepts, and the demonstration which was being carried out in EMT, together with the launch of a recognition scheme. This caused a positive discussion among the drivers, the management staff and the EMT ecodriving trainer who attended the event. All drivers involved in the demonstration expressed their commitment to reduce fuel consumption in order to achieve established objectives.

The final phase of the demonstration showed that the drivers succeed in their commitment reaching an average fuel consumption reduction of 3.4%. These results have shown a potential saving of more than 2 million litres and 5,300 tons of CO₂ per year in one of the biggest public transport companies in Europe, which travels more than one hundred million kilometres per year.

EMT Madrid considers this result as a success. The starting point of the demonstration was a low fuel consumption scenario, due to the fact that the drivers were already trained in ecodriving before the measurement of actual fuel consumption in buses during previous test phase. This proves that, in urban public transport, extra fuel savings of about 3-4% are possible with motivation and recognition schemes for drivers (even with no rewarding schemes), in addition to savings obtained with ecodriving training.

It is worth to underline that EMT is a public company, so it was not possible any monetary rewarding in this case. The scheme consisted in a public recognition of the drivers involved in the demonstration and the obtaining of a certificate.

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In conclusion, motivation with recognition has showed enough itself to reach higher savings with ecodriving, although it can be strengthened with other types of rewarding schemes.

The study of other initiatives such as the use of on board devices will lead to a better fuel management and, consequently, higher savings on fuel consumption and CO₂ emissions with the implementation of recognition schemes and other measures in the fleet of EMT Madrid.

During the last years the development of some initiatives in order to boost the sustainability of fleets is increasing in Spain – continuous training of drivers or alternative fuels and efficient vehicles are only part of the picture.

Hundreds of fleets in Spain, mainly public transport fleets, municipalities and freight transport fleets, have been informed about RECODRIVE results to learn about the experiences of demonstrations. Dozens of them have contacted Spanish partner showing interest in the project. BESEL has supported the commitment of several followers in Spain to reduce fuel consumption and CO₂ emissions.



Figure 34: EMT drivers with trainers from BESEL

Up to the end of the project the number of followers was six: two urban public transport fleets, one municipal fleet, one utility fleet, one freight transport fleet and one company fleet. The total number of vehicles is about 2,416, comprising urban buses and cars for passenger transport, utility vehicles such as tow trucks, and vans and light trucks for freight transport. The objective of most of these followers is to reduce about 5% of fuel consumption, but this figure reach up to more than 25% in one specific case in which there is a purpose of renewing the whole fleet with more efficient vehicles. According to their objectives, these followers could save about 5,000 tons of CO₂ emissions per year.

Name	Vehicles	Fuel (%)	savings	Reduction CO ₂ (t)
Guaguas Municipales S.A.	235	5		799.80
MBC of San Sebastián (Dbus)	121	5		2.500.00
NH Hoteles, S.A.	300	26.7		439.00
SEUR (SEUR GeoPost)	1,000	5		1,078.00
Ayuntamiento de Murcia	634	5.2		87.00
Madrid Movilidad	126	5		44.35
TOTAL	2,416			4,948.15

Table 11: Figures of the Spanish RECODRIVE followers

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The dissemination in Spain of project results with the last project newsletter in March has allowed many fleet managers to be aware of the potential benefits, so it is expected that the number of RECODRIVE followers is enlarged after the end of the action.

The main lessons learned, derived from the experience in Spain, are:

- Commitment and awareness of fleet managers and drivers is the key of success. Fleet owners should transfer their commitment to their staff, making them aware about the benefits of fleet objectives in relation with the sustainability of transport activities. Drivers have a major influence on fuel consumption.
- Driving conditions are very variable in urban areas. Many Spanish fleets are not convinced about the actual reduction of fuel consumption with ecodriving (especially in urban areas), but ecodriving courses of Spanish demonstrator show reductions of 15% in fuel consumption. Our experience has shown that real savings can be improved with the implementation of focused rewarding and recognition schemes.
- Efficient driving is not always a priority of the drivers. RECODRIVE demonstration in Spain has shown that rewarding and recognition schemes are an opportunity to keep high the motivation of drivers and improve the benefits of ecodriving.
- In public transport companies, rotations in drivers schedules with continuous changes in lines and buses makes difficult to monitor the fuel consumption of each driver. On-board devices for fuel consumption measurement are not usual in these fleets, but thanks to initiatives such as RECODRIVE they are beginning to consider them.
- Maintenance is made by third companies in many cases. Maintenance staff should also be included in training schemes.
- The implementation of initiatives to reduce fuel consumption should take into account the kind of transport (public/freight, urban/long distance, etc.). Aspects such as aerodynamics have a bigger influence in long distance transport than in urban transport (higher average speed). Routes optimisation is more suitable for freight transport than for public transport fleets – routes in public transport are less flexible. Nevertheless, service, routes and vehicles should be adapted to the demand in both cases.

The Spanish experience of RECODRIVE initiative has shown significant benefits for fleets in monetary and environmental terms. All fleets can benefit from these results with the implementation different kind of soft measures to reduce fuel consumption with really low cost actions, such as monitoring fuel consumption, ecodriving training, efficient maintenance of vehicles, routes and logistics optimization and implementation of rewarding and recognition schemes. Fleets should also bear future investments in mind for procurement of on board devices and efficient vehicles.

2.4.9 University of Maribor, Slovenia

Even though Slovenian demonstrators are operating in different transport fields (long distance freight transport, waste management and concrete transport) they have decided to implement the same basic fuel saving approach.

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In the first stage all of the companies have performed in depth analysis of existing situation comprising; fuel consumption, vehicle's specifications, type of work, fuel monitoring system and rewarding schemes. Based on the analysis and foreseen fuel saving interventions companies have defined their goals and objectives.

In the second phase the detailed implementation plan was developed for each individual company based on their goals and abilities to invest different resources. All companies have invested into driver training and fleet managers were obliged to take part and to gain insight on how the drivers were trained and what knowledge the drivers have gained.

It was noticed that fleet managers are interested in acquiring and implementing new knowledge but they are, in most cases, overloaded with day to day management and have very little time on disposal for finding sources of new knowledge. In order to solve this issue fleet managers have welcomed the idea of national central reference point that would offer information on sustainable fleet management and access to expert knowledge in national language. Such national reference point could be of enormous help and could offer the support most fleet managers are lacking at present.



Figure 35: Handing out of certificates in Slovenia

Additionally strong support to fleet managers from top management is crucial if the fuel saving interventions is to be successful in the long term regardless of the company type. Strong support from top management is also vital for development and implementation of recognition and rewarding scheme. In cooperation with top management and fleet management for each individual demonstrator company recognition and rewarding scheme was developed even though some companies did not implement them due to various reasons.

Deriving from demonstration period following lessons, divided according to thematic field, could be learned:

- General level
 - o Transport companies are aware of the importance of fuel consumption however they lack the knowledge on how to achieve lower consumption.
 - o Focused fleet management, appropriate organisation and rigorous fuel consumption monitoring can lead to positive results
 - o Significant fuel consumption reductions can be also with route optimisation,
- Fuel monitoring
 - o The quality of fuel monitoring systems in transport companies should be improved,

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- While in some transport companies fuel monitoring systems are in place, the data is often not adequately analysed and used by fleet/top management (fuel consumption data must be analyzed not only monitored),
 - Results are achievable also with application of manual data recording system provided that strict consistency is ensured,
- Driver related
 - Majority of drivers are not familiar with eco-driving principles,
 - Eco-driving technique is not part of basic driver training and is not mandatory for acquirement of driver's licence,
 - In general drivers are interested in new knowledge and despite the initial renunciation of new techniques all the drivers have tried to improve even though they were not always successful,
 - In order for the training to have positive impact, the approach to drivers should be based on positive motivation and strong support from fleet managers and also from top management,
 - It is advisable that first drivers to be trained are favourably disposed to new knowledge and eco-driving for these drivers act as front runners should inspire others to follow,
 - Two way communication between drivers and fleet manager is very important.
 - Procurement related
 - Procurement at Slovenian demonstrators is heavily dependant on the company's size. Large companies have well organized procurement department and vehicle (as well as spare parts) procurement is well in line with type and size of the operation the company performs.
 - Smaller companies have more room to improve as their vehicles are in some cases not perfectly matched to the operation. These kinds of mismatches usually causes higher fuel consumption as the vehicles do not have appropriate engine size or power train to the their work in the most efficient way.
 - Procurement of new vehicles suited to company's operations demands significant investments and is feasible over longer period of time (demonstration period was too short for this kind of interventions)
 - Vehicle procurement must be in compliance with specific transport demands,
 - Maintenance related
 - Maintenance is usually managed according to manufacturer's specifications due to the warranty liability deriving from proper maintenance procedures.
 - Communication between maintenance staff and drivers should be improved – it was established that drivers would like to have better communication with maintenance staff regarding their vehicles (any observations made by maintenance staff should be also addressed to the driver in question not only to the fleet manager).
 - Rewarding and recognition related

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- Rewarding and recognition schemes must be in-line with individual company's culture and adapted to specific characteristics of their vehicle fleet and field of operations with due consideration given to company's ability to implement additional rewarding on basis of lower fuel consumption,
- Variable part of employee's salary depending on achieved fuel consumption could be the optimal solution for Slovenian transport companies, reliable and accurate fuel monitoring system must be in place in order to provide relevant data on fuel consumption as basis for rewarding.
- Fuel monitoring system can be very simple (paper based) but it is important that the data from the system are reliable,
- Savings were also achieved with no rewarding scheme, only with driver training and strict monitoring of vehicle's fuel consumption correlated to the driver,
- Feedback to drivers on achieved fuel consumption is very important even if the rewarding scheme was not implemented,
- Suitable (financial) stimulation of drivers according to achieved fuel consumption is crucial for sustainable eco-driving performance,
- Optimal rewarding system should be based on interdependence between fuel savings and flexible rewards for drivers,
- Fleet management should also be stimulated/rewarded.

On the general level following issues should be addressed in order to further support companies with implementation of sustainable fleet management in the future:

- Positive environment (incentives, recognition schemes) for companies adopting the RECODRIVE concept in practice on national/regional level (not present in Slovenia)
- Awareness raising on importance of adequate employee motivation in transport sector.

In order to overcome the obstacles observed University of Maribor, Faculty of Civil Engineering:

- Has initiated active discussion process between stakeholders and policy makers about importance (national and company level) and advantages of RECODRIVE concept implementation,
- Is enabling access to complete RECODRIVE know-how on different possible rewarding schemes, fuel monitoring systems, organisation and implementation process in the transport companies,
- has proved realistic potential of RECODRIVE concept through achieved savings deriving from training and implementation of motivational systems in several Slovenian companies,
- Has ensured demonstrator's commitment to continue with implementation of further fuel saving interventions in order to sustain and surpass achieved results
- Has raised awareness on RECODRIVE (eco-driving) potential positive impact on lower fuel consumption among transport operators, driving schools, public administration in Slovenia (e.g. RECODRIVE workshop – presence of top representatives of: ministry of transport, ministry of environment, ministry of interior affairs, chamber of commerce, chamber of crafts, transport operators etc.)

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3 Results

Taking into account indicators mentioned in point 2, the following fuel savings were achieved in the demonstrator companies:

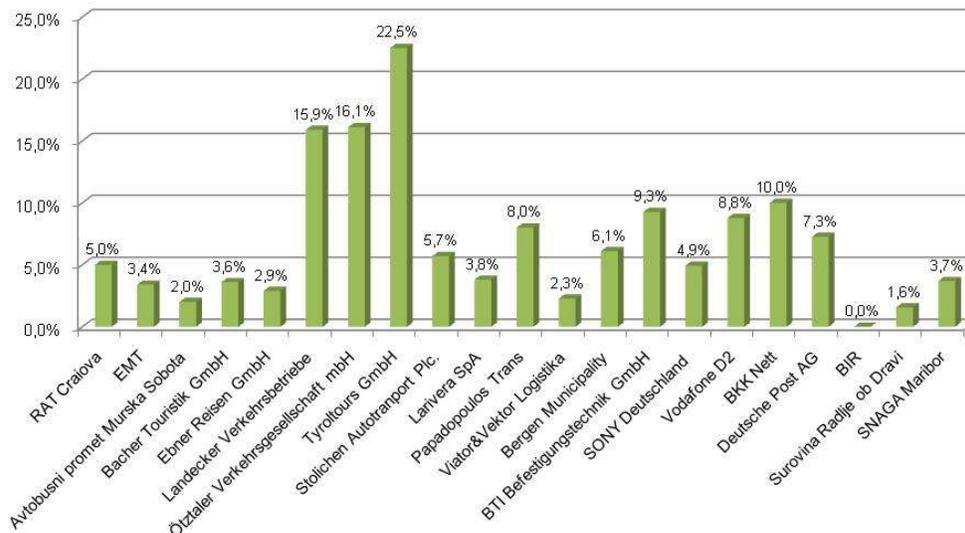


Figure 36: Achieved savings of the RECODRIVE demonstrators

Figure 36 shows that the achieved savings are ranging from 0% in only one case to 22.5%. It has been validated that savings of more than 10% are possible, but depending on the starting point and the phase of the implementation of the rewarding and recognition schemes lower values are typical for novices in the thematic.

It can be assumed that over a longer period of time and with uniform approach to fuel calculations, companies would demonstrate higher homogeneity of results.

3.1 Achieved results – impacts of the project (in bullet points)

3.1.1 Austria

- Overall reduction of fuel consumption of 10%
- High variance in the fuel consumption differences before and after due to different also technical reasons
- Savings depend “where you start from”
- For significant data you need a longer period of monitoring (e.g. summer-winter)
- Only driver-training is not sufficient
- Long-term results are depending on the attitude of the boss to this issue
- Rewarding is a very sensitive issue and you have to be very careful in implementing – we did not found the ideal approach

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- You should have one person in the company – an environmental agent
- Incentives for the company could be very interesting – an official certificate as a “green fleet”
- Increased sensitivity in the companies to the topic of reducing fuel consumption
- New ideas for a long-term approach
- Sharing knowledge and experiences of ways for reducing fuel
- Sharing experiences of rewarding and recognition
- Instruments, best practise cases and experiences for Rathgeb KEG to stay in touch with this topic

3.1.2 Germany

- Reduction of the fuel consumption between 5% and 10%
- Eco-training in practice or theory is necessary to reduce fuel consumption
- If you do not get fuel data electronically the effort would be too high to do reports
- Fuel savings can be reached without a rewarding scheme
- It is essential to inform the drivers monthly about their driving behaviour and the achieved results
- The decision maker in the company has to be convinced in order to join the project
- The reduction of fuel costs is the best incentive for companies
- The issue of sustainability in companies has to be increased by legislation
- The reduction of fuel consumption by the implementation of eco-driving in a fleet is only the first step with offers prompt results
- Further reductions have to be encouraged by the fleet manager by involving the procurement in the process (by adapting the car policy to fuel-efficient cars)
- Sustainability can only be given by continuous reporting to the drivers about their fuel saving status
- Rewarding schemes/incentives are difficult to implement in companies (e.g. work councils)

3.1.3 Greece

- Measurement must be accurate and consider of other variables, since the load and the route factors are crucial
- Monetary rewarding schemes are the major motivator in the Greek case
- The rapid rotation of drivers in the transportation business in Greece requires continuous training
- Needed technological modifications (such as GIS systems) may be an obstacle, in the crisis period
- Reduced fuel consumption with positive impacts on direct and indirect costs
- Team working can be enhanced, depending on the rewarding scheme
- Technological improvements may be required, depending on the type, the size and the use of the fleet as well as on the way of the fleet management
- Moving from ecodrive, meaning skills, to recodrive, meaning sustainability

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- A complete recodrive approach is an investment with definite gains!
- Reduced fuel consumption with positive impacts on direct and indirect costs
- Awareness of the importance of the sustainability of ecodriving techniques
- Awareness of the importance of other factors, apart from the driving techniques
- New skills and knowledge acquisition
- Speculation on the reliability of the “average consumption” indicator
- New rewarding schemes, other than productivity

3.1.4 Bulgaria

- Reducing the fuel consumption on the average 5.7%, but from 3.8% to 8.2% depending on the model of the bus, season and traffic conditions, etc.
- Lower maintenance costs by efficiently and eco-friendly bus/engine operation
- Improving the service quality and ensuring the routes in the municipality with buses in good working order to the demand, in particular to cover the peak traffic, etc.
- Increasing the perpetuation of the eco-driving recommendations
- More efficiently and eco-friendly operation of the fleet, etc.
- The rewarding scheme should be applied flexibly and combined by different ways:
 - o Financial rewarding
 - o Social and operation benefits – holidays increasing, lighter routers, new and more comfortable buses
 - o Recognition with labels, etc.
- Searching for a better approach for more efficiently and eco-friendly operation of the fleet
- Stimulation of the companies with “green fleet certificate” received for fuel consumption reduction and more efficiently and eco-friendly operation
- Application of good practices and sharing of the knowledge and experiences of rewarding
- Encouraging the improvement of the routes in the municipality and management of traffic with ensuring the priority of the buses

3.1.5 Romania

- Traffic conditions have a major influence on the fuel consumption
- Driver’s behaviour is less important than traffic conditions
- An obvious difference could be noticed between the 2 driver teams in the 100% urban area
- No major difference could be noticed between the 2 driver teams in the 50% suburban area
- Maintenance
- Air filter cleaning is reducing fuel consumption with about 2%, for a same driver, in similar traffic conditions and bus loading; it should be cleaned every two weeks and replaced after 45,000kms running; engine indicator is showing filter state.
- An additional fuel saving might be obtained by replacing engine oil earlier than the recommended interval but the advantages are cancelled by additional costs
- Tire pressure control

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- By reducing it with 0.5bar, at all front and back wheels of bus 443 (transferred from line 9 to line 6 in June 2009) a fuel consumption increasing with about 2.4% was registered, for a same driver and in similar traffic conditions and bus loading.
- A different impact of the trainings and a specific perception of each driver team on the proposed rewarding scheme were noticed. The tested monetary rewarding scheme proved to have a lower impact than expected on driver's behaviour.
- A 'defensive and preventive' driving, combined with a rational driving and a good knowledge on vehicle's features, are the key issues for an energy efficient (eco) driving (fuel saving 2.47%)
- Some specific maintenance measures implemented even with new EURO4 engine buses caused a fuel saving of 1.3%
- Routing, leading to a 100% linear bus corridor, reduced fuel consumption (fuel saving 1.6%)
- Another 5% potential savings might be registered when the local authority would invest or encourage bus priority in traffic. This estimation is based on a comparison of the specific fuel consumption registered by the monitored buses on two different lanes (one in urban area and another with a half sub urban area).
- Rewarding and recognition schemes are offering Romanian public transport operators new approaches regarding their fleet energy efficiency improvements in the coming years.

3.1.6 Italy

- New buses and coaches are very different from older vehicles: wrong procurement approach (e.g. dashboard showing FC is optional for manufactures) and wrong use of devices (retarder, cruise control) was noticed and had to be solved
- Recognition & Rewarding Scheme:
 - NOT a technology based application and NOT a big investment: also a very simple scheme (i.e. paper based) can be designed, adapted and implemented having poor refuelling & maintenance data
 - From human resource to HRs: the scheme needs someone (one responsible / coach) to fix targets and check for outliers values
 - The scheme should be flexible: adaptations of targets every month depending on weather conditions, passenger flows, drivers' turnover, traffic conditions, etc.
 - Targets have to be "real": not easy to be reached by everybody with a poor driving style adaptation; it is not a motivational game for shifting costs from fuel to bonus savings also for the fleet!
 - What happens when ecodriving is an achieved ability? A GOOD scheme will easily reach savings of 10% in the long run... again, adapt your scheme!
- Green fleets & the human element, the future:
 - Fleet renewal cannot be the only option
 - Service monitoring (e.g. AVM telematics), total service maintenance and human resources should be connected via the scheme
 - Drivers and maintenance employers appreciate practical trainings with experts/instructors

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- ISO9001, ISO14000, ITS investments > a rewarding scheme could be a low-cost option... but you need an expert, not a commercial agent or other not necessary devices!
 - Look at FMS-Standard: the gateway allows for driving style monitoring... please plug your AVM to vehicles!
 - Driver shortage, CPS costs and funding opportunities, time to decide
- A rewarding and recognition scheme (R&RS) focused on energy efficiency has no technological constraints. It can be implemented also with very simple paper-based refuelling data but needs an internal coordinator (i.e. a “team coach”);
 - A rewarding scheme based on monetary bonus has to be sustainable also for the company (during the RECODRIVE demonstration we applied bonus and penalties against monthly-based fuel consumption targets) and sufficiently flexible to take into account achievable targets (i.e. not only related to vehicle optimal performance but also adapted to seasonal aspects and altitude profiles));
 - Historical fuel consumption (FC) figures are not the “guidance” for implementing a proper R&RS: optimal or targeted FC performances have been used to look into real savings (i.e. actual performance). In 6 months of monitoring we reached -3.8% against targets, which means more than 9% of savings against historical figures;
 - A R&RS has a positive side effect on vehicles: Less fluctuations and more stabilised FC performances, which means benefits also for the vehicle’s maintenance;
 - New buses and coaches are very different from older vehicles: driving style of young and recently trained drivers is more appropriate than experience-based driving of older drivers. A wrong use of modern devices (i.e. retarder and cruise control) has been detected during the demonstrations;
 - Most public transport companies applies a wrong vehicle and ITS procurement approach (e.g. dashboard showing FC is “optional” for manufactures and FC or energy performances are not integrated in Automatic Vehicle Monitoring systems);
 - Other fleets running just ecodriving actions asked for more information about the scheme due to the need of effectively produce a behavioural change and benefits in the long run;
 - Policy makers are reconsidering their policy: Regione Emilia Romagna is taking interest in the project issues for supporting long term ecodriving programmes in addition to grants for fleet renewal.

3.1.7 Norway

- Public companies:
 - Large potential impact of the actions beyond the project period.
- Role models for other municipalities and public sector in general
 - Actions need to be compatible with long term plans for public spending
- BK – municipal fleet
 - Revealed potential for savings due to more efficient composition of fleet
 - Established sophisticated registration system for fuel consumption
- BKK – inter-municipal power company
 - Logistics and route planning highest potential

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- Successful ecodriving that motivated to expand the training to large part of fleet
- Savings unclear (severe weather, change in fleet operation)
- BIR – inter-municipal waste handling
 - Due to the nature of the fleet, route optimisation was considered to be the most efficient action to achieve fuel saving
 - Ecodriving relatively low potential in comparison
- RECODRIVE has:
 - Contributed to the municipal policy of reducing CO₂-emissions
 - Increased motivation and knowledge of fuel saving actions.
 - Improved cooperation between different actors on fuel saving strategies and actual implementation
 - Cultural differences within Europe calls for diversity in rewarding schemes, e.g. non-monetary more suitable for Norway

3.1.8 Spain

- Commitment and awareness of fleet managers and drivers is the key of success
- Driving conditions are very variable in urban areas:
 - Many Spanish fleets are not convinced about the actual reduction of fuel consumption with ecodriving (especially in urban areas), but ecodriving courses of Spanish demonstrator show reductions of 15% in fuel consumption
 - Real savings can be improved with the implementation of focused rewarding and recognition schemes
- Efficient driving is not always a priority of the drivers:
 - RECODRIVE demonstration in Spain has shown that rewarding and recognition schemes are an opportunity to keep high the motivation of drivers and improve the benefits of ecodriving
- In public transport companies, rotations in drivers schedules with continuous changes in lines and buses makes difficult to monitor the fuel consumption of each driver:
 - On-board devices for fuel consumption measurement are not usual in these fleets, but thanks to initiatives such as RECODRIVE they are beginning to consider them
- Maintenance is made by third companies in many cases. Maintenance staff should also be included in training schemes
- The implementation of initiatives to reduce fuel consumption should take into account the kind of transport (public/freight, urban/long distance, etc.):
 - Aspects such as aerodynamics have a bigger influence in long distance transport than in urban transport (higher average speed)
 - Routes optimisation is more suitable for freight transport than for public transport fleets – routes in public transport are less flexible
- RECODRIVE partner has motivated in Spanish demonstrator Madrid EMT the study of further initiatives to reduce fuel consumption and CO₂ emissions in addition to the ecodriving training and the use of alternative fuels, such as the implementation of

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recognition schemes, the use of onboard devices or the efficient maintenance, among others

- According to the demonstration, extra fuel savings of 3-4% are possible with motivation and recognition schemes for drivers in urban public transport (even with no rewarding schemes), in addition to savings with ecodriving
- These results have shown a potential saving of more than 2 million litres and 5,300 tons of CO₂ per year in one of the biggest public transport companies in Europe (Madrid EMT)
- Hundreds of fleets in Spain, mainly public transport fleets, municipalities and freight transport fleets, have been informed about RECODRIVE results to learn about the experiences of demonstrations. Dozens of them have contacted Spanish partner who has supported the commitment of several followers in Spain to reduce fuel consumption and CO₂ emissions. These followers could save about 5,000 tons of CO₂ emissions per year

3.1.9 Slovenia

- Constant and adequate feedback (drivers↔fleet management) is very important, fleet management should also be motivated (stimulated/rewarded)
- Suitable (financial) stimulation of drivers according to achieved fuel consumption is crucial for sustainable eco-driving performance
- Fuel consumption data must be analyzed not only monitored – overall the quality of fuel monitoring systems in transport companies should be improved
- Results are achievable also with application of manual data recording system provided that strict consistency is ensured
- Optimal rewarding system should be based on interdependence between fuel savings and flexible rewards for drivers
- Transport companies are aware of the importance of fuel consumption however they lack the knowledge on how to achieve lower consumption
- Rewarding and recognition schemes must be in line with individual company's culture and adapted to specific characteristics of their vehicle fleet and field of operations with due consideration given to company's ability to implement additional rewarding on basis of lower fuel consumption.
- Variable part of employee's salary depending on achieved fuel consumption can be the optimal solution for Slovenian transport companies
- Awareness raising on RECODRIVE (eco-driving) potential positive impact on lower fuel consumption among transport operators, driving schools and public administration in Slovenia and initiation of the active discussion process between stakeholders and policy makers about importance (national and company level) and advantages of RECODRIVE concept implementation.
- Enabling access to complete RECODRIVE know-how on different possible rewarding schemes, fuel monitoring systems, organisation and implementation process in the transport companies.

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- Development of effective fuel consumption monitoring schemes and their implementation in the demonstrator companies and implementation of different rewarding (recognition) schemes in different companies (adopted to the company specific needs and possibilities)
- Achieved savings through training and motivation in several Slovenian companies as a proof of realistic potential of RECODRIVE concept.

3.2 Direct impact from the RECODRIVE activities

3.2.1 LARIVERA SpA, Italy (public transport)

The project demonstration has established complete fuel monitoring system for the fleet. Despite its very simple approach it was proven that also with a few data and/or with incomplete refuelling data it is possible to implement a proper rewarding scheme.

However the consolidation and analysis of refuelling data has proven quite demanding.

Due to incompleteness in registrations or partial refuelling, some “outliers” values had to be cancelled from the scheme. This clearly means that paper based registrations should be substituted with e-cards facilities and a proper software.

Nevertheless results have been well above the company expectations of saving at least 7,000 litres of fuel per year (around 5% of the total annual consumption). It has been demonstrated that during the 6 months of monitoring activities the final fuel consumption result was on average 4% better than the targeted fuel consumption. If we consider savings against worse or not rewarded performances, real savings are also higher.

Two levels of fuel savings were identified:

- Savings in terms of variance between a “normal or bad” driving style and the target (which are difficult to be correctly calculated)
- Savings in terms of variance between the target FC and obtained or “real” FC

Looking at historical figures related to the first acquisition and weekly consumptions of the materials, the procurement department has adapted the overall strategy by introducing several elements of evaluation for the purchased products mostly based on green procurement concepts (e.g. fuel economy indicator on the dashboard). Current fleet management procedures from the ISO9001 manual (e.g. type and timing of regular checks) have been calibrated against different energy efficient schemes.

3.2.2 RAT Craiova, Romania (public transport)

The 12 trained drivers increased their awareness on the importance of an eco-driving behaviour. A ‘defensive and preventive’ driving combined with rational driving and a good knowledge on vehicle’s features are the key issues for an energy efficient driving style leading to the achieved savings:

A more comprehensive database and the approach of the tests results analysis are of considerable support for periodical energy strategy reconsideration.

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A further extension of some measures to the whole bus fleet might lead to additional 5% fuel savings, resulting in financial savings of operational costs with about 100,000 Euro/year.

11 followers from Romania proved to be concerned with the RECODRIVE topic. They received a Follower Certificate. Following RECODRIVE dissemination, more than 882 tons of diesel per year and 2,658 of CO₂ per year will be saved by these 11 PT operators from Romania starting with 2010.

3.2.3 Papadopoulos Trans, Greece (freight transport)

The first reliable comparable data were generated on September 2009 and the average diesel consumption declined by 8% (approx. 0.35lt/km). The new average consumption level seems to be standardized to this level, but the company's management believes that with the monetary motivation the fuel consumption can decline even further.

There is no obvious benefit in terms of tires wear, break wear or maintenance needs. The management stresses that those benefits cannot be extracted from eco-driving or cannot be assessed, for long distance freight carriers.

Finally, Papadopoulos Trans has just proceeded to updating of the GIS system, installed to all trucks. The new system, apart from the monitoring of the vehicles current position globally and of the distance travelled, measures the diesel level in the tanks, calculating average consumption automatically. The new GIS system is operated by Vodafone Greece, in cooperation with Zelitron Co (<http://www.zelitron.net>).

3.2.4 Viator&Vektor, Slovenia (freight transport)

The drivers that were involved in eco-driving training have achieved significant savings in six month period after the training – on average 112 litres of fuel were saved by each vehicle every month. That comes to 4,025 litres of fuel saved by six trucks alone. As in-house instructors these drivers are now passing their knowledge to other drivers through informal meetings and conversations even though the rewarding scheme was not implemented. Consequently the sustainability of the above mentioned results could be jeopardised.

The results of RECODRIVE project in Viator&Vektor are promising and show that significant improvements of fuel consumption can be achieved through driver training. Through further expansion of eco-driving knowledge among drivers notable fuel savings should be achieved however in the absence of rewarding scheme constantly motivating the drivers, the sustainability of achieved lower fuel consumption might be uncertain.

3.2.5 SNAGA Maribor, Slovenia (utility fleets – waste collection)

The results show that, even in waste transport with specific characteristics, fuel savings are achievable. The company has achieved on average 3.7% reduction of fuel consumption through period of eight months through driver training and motivation. The three involved drivers have achieved noticeable savings after the training – on average 56 litres of fuel were saved by each vehicle every month.

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On the other hand companies should look for areas, beyond driving and vehicle specifications, that could enable the company to lower their fuel costs such as improved routing. According to that the company has reorganized and optimised part of their routing plan for waste collection and is now able to collect the same amount of refuse on the designated area with one vehicle less. Further routing optimisation is foreseen.

The company has also shown high interest in matching vehicle specifications with their needs for future procurement as it was established that currently owned vehicles are not perfectly matched with work requirements.

The positive example of Snaga proves that even companies operating under specific and demanding conditions can achieve fuel saving through appropriate measures. More importantly as these vehicles operate in urban environment reductions of CO₂ emissions directly influence the quality of living environment in the cities.

4 Success stories

4.1 Slovenia

RECODRIVE has been voted by the expert committee as one of the top three energy efficient projects in Slovenia for 2010. The reward for “energy efficient project” is granted by the Slovenian Ministry of Economy and newspaper Finance. The winner will be announced on 20th April within the conference “Days of energetics 2010”.

Two case studies of the University of Maribor are available on the RECODRIVE web page:

http://www.recodrive.eu/index.phtml?id=1039&study_id=2595

http://www.recodrive.eu/index.phtml?id=1039&study_id=2596

After the end of the action University of Maribor plans to continue with activities regarding active discussion process between stakeholders and policy makers about importance (national and company level) and advantages of RECODRIVE concept implementation. University of Maribor will also support all interested parties and enable access to complete RECODRIVE know-how on different possible rewarding schemes, fuel monitoring systems, organisation and implementation process in the transport companies. University of Maribor will disseminate RECODRIVE experiences and knowledge at suitable events and occasions. Additionally some meetings with transport companies and manufacturers of monitoring equipment are foreseen in order to help companies develop suitable rewarding and recognition scheme.

4.2 Bulgaria

On the one hand the fact that the demonstrator Stolichen Autotransport Plc. is the biggest public transport company in the country and covers the main part of the public bus transport in the Capital Municipality of Sofia, allows the results and achievements of the project to be disseminated to other companies and to the community in- and outside of the capital. On the other hand after the end of the project will be continued with:

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- Networking of the companies for searching for other companies relevant approaches for efficiently and eco-friendly operation of the fleet, sharing of the knowledge and experiences of rewarding
- Dissemination of information of the RECODRIVE project and good practices for fleet reco-management
- Stimulation of other companies to take efforts to receive “green fleet certificate” for fuel consumption reducing and more efficiently and eco-friendly operation, and also the municipalities to apply suitable instruments/tools for reducing of the companies dues, tax concessions, etc. for the green fleets/ companies

4.3 Romania

Electric urban public transport in Craiova Municipality – Craiova, ROMANIA: The transport on the main axis of Craiova city, from East to West, is assured by 26 second hand trams.

The electric supply system and the tracks for these trams are quite old. This is the major reason for which the electric Public Transport system in Craiova, both trams and infrastructure, needs major improvements. Another reason is to reduce the exploitation costs, in parallel with increasing passengers’ safety and comfort. The final goal is to reduce the energy invoice for the whole electric PT system.

In order to observe the same tendency of improving the quality of local PT services assured by different operators from the European Union, RAT Craiova has taken into consideration environmental requirements, the reduction of the energy consumption and planning of its services according to the passenger flow.

RAT Craiova is endowed with old trams which have not been used for some time; as such, they have an old fashion driving system and a high power input/consumption. This system can be replaced by a system with chopper driving system, 9 trams being able again to be used with low power consumption.

Due to the chopper’s electric circuit, currents of hundred amperes are appearing in tram driving system, for short intervals. These currents may disturb different electric systems existing in the proximity of the chopper. These disturbances can be avoided by using a radiofrequency filter in series with the input filter and the smoothing coils from the chopper’s power circuit. Simulations of the filtering circuits have shown their influence over the operation of a trams’ electric energy supplying system. Using a programme dedicated to the electric circuit analysis (like SPICE), the variations of the voltage when the radiofrequency filter is present or absent can be illustrated.

Experimental determinations were performed on a tram, subject to modernisation, with respect to the driving system chopper. The voltage at chopper’s output and the current absorbed from the electric supplying network were recorded. The recordings were achieved for various current steps



Figure 37: Handing out a certificate in Romania

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of acceleration and respectively for the braking regime on a tram using chopper. The different steps for current at acceleration and braking were observed. In the same time the numerical records emphasize the choppers' efficiency, including the processes for the electric energy regeneration. The efficiency of the input filter was noticed, thanks to the capacitor of this filter discharging. The energy transmitted through resistive couplings toward network and inductive couplings had no influence over the supplying line, the braking regeneration regime being normal.

Taking into account the project's progress, the results are:

- Improving passengers comfort by eliminating the start-up and braking shocks
- Reducing power by about 35%

Furthermore many followers could be addressed. The certificates have been handed out in an official ceremony. Due to the presentations in the public, the awareness could be raised significantly in Romania. The number of Romanian followers shows the high interest in the topic and the wide spread of the RECODRIVE approach. The initiative has already been leading to public discussions on this issue and it can be assumed that the measures will be continued due to the tremendous results!

4.4 Germany

Deutsche Post AG NL München / Landshut

Deutsche Post is Germany's market leader in mail delivery services. The company operates around 60,000 vehicles (mainly light commercial vehicles and trucks) across Germany. Deutsche Post was interested in reducing fuel consumption (for cost reasons) and CO₂ emissions (with regard to public awareness). Therefore they agreed in a pilot project in the South of Germany (business area Munich).

The driver trainings and the determination of the general conditions and reference values took place in the beginning of 2008. 92 vans and trucks participated in the demonstration.

“Drawing of awards to the group of best drivers” was chosen as incentive for the fuel saving.

With a fuel consumption of 267,276 litres per year and a yearly mileage of 1,463,000 kilometres the following success in CO₂ reductions could be noticed:

Kilometer	Fuel consumption in liter	Historic fuel consumption in liter	Savings fuel consumption in liter	CO2-emision in kg	Savings CO2-emision in kg	Savings in percent
1.463.531	286.682	267.276	19.406		50.457	7,26

Figure 38: Results regarding fuel and emission savings at Deutsche Post AG, Germany

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4.5 Greece

Background and objectives

The initial and constant demonstrator is the transport company “Papadopoulos Trans”.

Papadopoulos Trans is a pure Greek transporting company, operating for more than three decades in the road transporting business.

It is focused on transport on transport with isothermal foodstuff tank trucks and refrigerated trucks.

Moreover, the company has established to all its trucks GIS systems to be able not only to locate their position, but also to monitor their route and speed.

The company’s most frequent destinations are Greece, United Kingdom, Germany, Austria, France, Italy, Belgium, Holland, Spain, Luxemburg and Switzerland.

We have to stress that all 42 vehicles of the company were involved into the monitoring system.

We also have to point that the main focus of the training and the rewarding scheme were the drivers. The reason is that maintenance is provided externally and procurement is the management’s decision. In that sense, top management could not be included into the rewarding scheme.

The yearly diesel consumption exceeded 2,000,000 litres per year. The average fuel consumption of the fleet was initially 0.38lt/ km.

Implementation

The training strategy was the running of quality circles with focus groups. After an introduction to the scope of the new system, the rewards and some Ecodriving techniques, a round table discussion was running.

Trainings started on July 2008. The total number of drivers trained was 50, since, as mentioned above a few of the initial ones left the company.

The strategy of quality circles than just tutoring was chosen because, as the management stressed, “Greek drivers prefer to speak than listen”. It is also true that most professional drivers are aware of the basics on how to eliminate fuel consumption, but the lack of motivation makes them unconcerned.

Papadopoulos Trans had 2 major benefits in trying to implement a rewarding scheme:

- The vehicles had installed GIS devices and the company could measure easily the distances travelled per trip.
- The company had been calculated fuel consumption (litres of diesel/km) since the early ‘90’s.

On the contrary, three issues put the reliability of the data, in terms of comparison, into consideration:

- Truck drivers change companies quite often in Greece. That means that different drivers must be trained on Ecodriving techniques.
- Not all routes require the same driving style. Greek routes require more fuel and central European routes less.

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Even though the gross weight is more or less the same (40 tons), in some cases the trucks deliver goods and return to Greece empty, or leave Greece empty and carry back goods. In those cases, the average fuel consumption per trip differs.

After discussion with the management, those alterations were smoothed and a new indicator was born: Average consumption per ton carried. This new indicator is not yet supported by the company's ERP software, but with the synergy of the new GIS system and the ERP, the indicator will be in use soon.

The rewarding scheme was purely monetary and the basic principle was a 50%-50% sharing of the monetary gains from lower fuel consumption.

Achievements

The first reliable comparable data were generated on September 2009 and the average diesel consumption declined by 8% (approx. 0.35lt/km). The new average consumption level seems to be standardized to this level, but the company's management believes that with the monetary motivation the fuel consumption can decline a little more.

Finally, Papadopoulos Trans has just proceeded to updating of the GIS system, installed to all trucks. The new system, apart from the monitoring of the vehicles current position globally and of the distance travelled, measures the diesel level in the tanks, calculating average consumption automatically. The new GIS system is operated by Vodafone Greece, in cooperation with Zelitron Co (<http://www.zelitron.net>).

4.6 Austria

Ötztaler Verkehrsgesellschaft m.b.H.

Ötztaler Verkehrsgesellschaft is a medium sized bus and coach company with 30 busses and coaches. They have an overall fuel consumption of around 500.000 litres per year.

Our target was saving 10 % and we implemented the project in three steps:

1st step: Pre testing phase: We implemented in 8 busses an onboard device of mixtelematics. This system is able to monitor fuel consumption bus also measures the driving style of the driver. This pre testing phase lasted from January to April 2009.

2nd step: Training phase: In April and May 2009 we trained 125 drivers in ecodriving

3rd step: Evaluation phase: We reached in this company the target of 10 % and had also positive effects on the driving time. In order to preserve the positive results, the company will implement a rewarding and recognition scheme.

The managing director stated, that the attitude of the drivers to fuel saving changed since we started with the project.

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4.7 Spain

EMT Madrid

The Spanish case study is available on the RECODRIVE website:
http://www.recodrive.eu/index.phtml?id=1039&study_id=2599

This case study describes the actions carried out by Spanish demonstrator EMT Madrid implementing RECODRIVE project measures in order to evaluate the benefits obtained in terms of energy saving and reduction of greenhouse gas emissions.

The demonstration shows that it is possible to improve the results on fuel consumption if the drivers have the commitment to do it. In conclusion, motivation with recognition has shown enough itself to reach higher savings with ecodriving, although it can be strengthened with other types of rewarding schemes.

EMT Madrid continue evaluating new initiatives to reduce fuel consumption such as the use of on board devices which will lead to a better fuel management and, consequently, higher savings on fuel consumption and CO₂ emissions with the implementation of recognition schemes and other measures in their fleet. The purchase and use of efficient vehicles such as electric and hybrid buses and alternative fuels such as Compressed Natural Gas (CNG) or biodiesel is also a priority in the company policy in the last years. Nowadays, the whole fleet consists in alternative propelled vehicles.

5 Lessons learned

Validating the acceptability of the RECODRIVE approach through implementation of fuel saving measures and recognition and rewarding schemes was one of the major objectives of the RECODRIVE project. Various companies in all project partner countries have tested the applicability of different fuel saving measures. Several recognition and rewarding schemes were developed and implemented in participating companies, good results were achieved and valuable experiences were gained. Deriving from these experiences recommendations for fleet managers are summed up and grouped according to the fleet type.

Even though positive results were achieved, it is unrealistic to expect that companies would be able to achieve these results without strong external support. The demonstration has shown that transport companies usually don't have sufficient human and financial resources that could be allocated to the implementation of sustainable fleet management. Additionally, companies in general are not aware of the benefits of sustainable fleet management and lack the needed expertise to implement it in practice. However it is important to point out that companies are interested in implementing fuel saving interventions and measures that ensure long term results.

The project findings imply that policy-making should address sustainable fleet management and establish a supportive legislative environment in order to boost sustainable fleet management in transport companies. A range of possible policy measures for sustainable fleet management implementation in transport companies is suggested. The RECODRIVE website www.recodrive.eu lists all the measures seeking to alleviate the barriers identified in the pilot projects.

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Besides standard measures such as economic incentives and regulations, the establishment of a network of competence centres, promoting sustainable fleet management practices in EU regions is the most crucial.

Targets for competence Centres on Ecodriving:

- Maintenance to be included!
 - o Driver training is only one of the measures to be taken - it has to be combined with maintenance (air filter cleaning, tire pressure control...) and route optimisation
 - o Maintenance - applicable to all kind of fleets, is often done by third parties - so measures or indicators have to be included in the contract which might have some rewarding elements itself.
- Some parts of fleet management are still untouched!
 - o Vehicle procurement has still to be developed further, since it has to be in line with the transport demands
- Continuous effort needed to keep the intelligence in the fleet
 - o Continuous training is required - due to high fluctuation of drivers (no impact of directive 2003/59/EC yet)
 - o Efficient driving style is not always a priority of the drivers - thus training, motivation of drivers, rewarding schemes are necessary
- Rewarding has two faces
 - o Monetary rewarding schemes can be major motivators, but should not be seen as part of the payroll
 - o Long-term results depend on the continuous commitment of the management
 - o Rewarding is a sensitive issue; it has to be in line with the company's culture in order not to create undesired side effects
- Rewarding has to be flexible and combined to the needs of the fleet
 - o Financial rewarding
 - o Social benefits: Additional days off, satisfying tasks, incentives acting on a psychological level
 - o Badges for fuel saving champions
- Quite some difference in fleet management quality
 - o Monitoring: fuel consumption measures are not usual in some public transport companies; data is available, but not adequately analysed and used by the management
 - o Fuel theft and private vehicle use is a very big motivator for setting up monitoring schemes
- Monitoring needs sophisticated approach
 - o Load and route factors are crucial (measurement has to consider these factors)
 - o Traffic conditions have a major influence on the fuel consumption /CO₂ emission
- Positive side effects
 - o Decrease of accidents
 - o Decrease/elimination of working stress of the drivers
 - o Decrease/elimination of vehicle breakdowns - caused by rough usage and poor maintenance

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- Learn your lessons - fleet managers!
 - o Aerodynamic - useful in long distance transport (not in urban transport)
 - o Route optimisation - applicable in freight transport
 - o Feedback (drivers<->fleet management) is very important
- High quality fleet management needs a platform
 - o Fleet management - should also be stimulated/rewarded
 - o Knowledge exchange amongst fleets
- Opportunistic procedures needed – windfall profits from installing time management systems
- Public Fleets often depend heavily on politicians
- Division into human resources and depot is not helpful to implement Recodrive!
- After breaking the resistance, the project runs smoothly
- Human deficiencies (of staff) shall be added to the monitored topics needing
 - o Sophisticated assessment of new staff
 - o Mitigation processes
- Co-operation amongst operators brings new knowledge about vehicles and subsequently allows better negotiations with suppliers
- Finally: Moving from ecodriving to Recodrive means entering into sustainability of fuel savings and a more efficiently and eco-friendly fleet operation.

6 Recommendations for...

6.1 Recommendations for public transport

- Install on-board fuel monitoring systems if possible on the other hand simple paper based approach to fuel monitoring can work as-well,
- Create teams of drivers and monitor each team's consumption if monitoring of individual driver's fuel consumption is not possible,
- Through positive employee training (drivers, fleet managers, procurement and maintenance staff) you will improve the knowledge on fuel consumption but this issues should be addressed daily in order to achieve long term results,
- Implementing recognition and rewarding scheme is very sensitive thing so make sure you carefully plan it and that you develop the scheme in cooperation with your employees,
- Recognition schemes work well in public companies where rewarding is not possible,
- Commitment of the drivers is the key to success,
- Communicate the importance of appropriate vehicle equipment (on-board computers) to procurement department especially for new vehicles

6.2 Recommendations for long distance freight transport

- Support from top management is essential for success,
- Group your vehicles on basis of vehicle characteristics (manufacturer, engine power, transmission etc.), load and route characteristics and compare fuel consumption within the same group,
- Use installed on-board devices and fuel monitoring systems,
- Emphasize appropriate settings of air deflectors according to type of trailer,

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- You might encounter initial resistance from drivers but through positive approach and proven results even reluctant drivers will start cooperation over time,
- Positive approach to fuel saving interventions will improve relationship between management and drivers,
- Be creative in finding ways to convince your employees (drivers) to behave in an energy efficient way, use alternative motivators on win-win basis,
- Fuel consumption indicators: you should consider implementation of more than one fuel consumption indicator (e.g. “kilometres travelled per litre of fuel” or “litres of fuel per 100 kilometres” omits the influence of load weight on fuel consumption.).

6.3 Recommendations for utility fleets

6.3.1 Cars

- The most important experience was to get a focus on fuel saving through a dialogue and exchange of information with the other demonstrators,
- Fuel consumption monitoring is very important in order to determine actual fuel savings achieved,
- Management should consider carefully if the recognition and rewarding scheme is in line with specific culture and social environment,
- Good organisational overview as well as fleet overview (number of cars of different types, drivers etc) makes it easier to reduce fuel consumption. It provides basis for making appropriate decisions where needed.
- Constant periodical feedback to the drivers can function as a motivational impulse even without recognition and rewarding scheme.

6.3.2 Vans

- Institutional learning is crucial. The management should find new ideas on how to save fuel and the economy of it. The perspective should be generally included in the everyday work of the company.
- Focus on fuel saving should be permanent and continuous in order to achieve a reduction of the fuel consumption.

6.3.3 Trucks

- Regular periodical feedback to drivers is crucial,
- Information on achieved CO₂ savings can function as a strong motivational element,
- Focus on fuel management should be permanent and continuous in order to achieve a reduction of the fuel consumption

6.3.4 Waste collection

- Route planning is extremely important and with optimisation of routing it is possible to execute the same work amount with less vehicles,
- Procurement should be well planned as vehicle’s specifications must correspond to the operational requirements,

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- It is highly recommendable that drivers are trained in eco-driving,
- Drivers must be familiar in details with their vehicle's technical characteristics in order to use them in the most efficient way.

6.4 Recommendations for fleet managers

The implementation of fuel saving interventions, recognition and rewarding schemes is potentially an effective way to realise significant cost savings. However, careful consideration needs to be given to any intervention before investing in it, as not all interventions are suitable for all operations. The same applies for the recognition and rewarding schemes - before the implementation of such scheme the management should carefully consider what options are best suited with regard to the fleet type, company's culture and social environment.

The best way to discover if an intervention can and will result in fuel savings within an operation is to test them during the trial period involving smaller number of vehicles and employees. This enables the management to test the effectiveness of selected measures and to choose only the most effective ones for the implementation on the entire fleet. The same can be done for recognition and rewarding schemes especially if the company is managing large vehicle fleet and if considerable number of employees will be affected.

6.4.1 Management

The achievement of fuel savings invariably requires an investment in time, effort or money – and often all three. In order to minimise the investments and to maximise the effect following recommendations have derived from the demonstrations within RECODRIVE:

- Focus on fuel saving should be permanent and continuous in order to achieve reduction o fuel consumption.
- Strong support from top management is essential for success.
- Energy efficiency must be incorporated into all operations not only to vehicle fleet,
- Exchange the information and establish a dialog with other companies operating in the similar field in order to learn from them.
- Management should consider carefully if the recognition and rewarding scheme is in line with specific culture and social environment,
- Good organisational overview as well as fleet overview (number of vehicles of different types, drivers etc) makes it easier to reduce fuel consumption. It provides basis for making appropriate decisions where needed.
- Institutional learning is crucial. The management should find new ideas on how to save fuel and the economy of it. The perspective should be generally included in the everyday work of the company
- Route planning is extremely important and with optimisation of routing it is possible to execute the same work amount with fewer vehicles.

6.4.2 Fuel monitoring

One of the most important areas of efficient fleet management is data and fuel consumption monitoring. Without good and reliable data the ability to generate long-term improvement in fuel

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performance is diminished. Additionally the fuel consumption data represent the basics on which the recognition and rewarding scheme is developed. Following recommendations on fuel monitoring are as follows:

- Use reliable and user-friendly fuel monitoring systems on the entire vehicle fleet.
- Monitor fuel consumption regularly, use the information and give feedback (periodical reports to drivers, management and maintenance).
- Take into consideration influence of seasonality (compare corresponding months/periods with similar weather/temperature conditions).
- Use bench-marking (compare to other similar fleets).
- Install additional fuel monitoring systems – on-board devices enabling precise monitoring of fuel consumption and several other important indicators (RPM, speed, acceleration, deceleration, exhaust brake etc.) if you can.
- Fuel consumption monitoring is very important in order to determine actual fuel savings achieved.
- Telematics - these systems can be a very effective way of monitoring fuel use and establishing where action can be taken to reduce fuel consumption.

6.4.3 Human resources

When considering recognition and rewarding schemes it is important to stress that there are no universalistic rewarding schemes. Recognition and rewarding have to be embedded in company with regards to different work-conditions, cultural contexts etc. Based on this it would be unwise to present one rewarding and recognition scheme that “fits all.” This has to be evaluated on the basis of each organization. As the demonstrators have tested different approaches to recognition and rewarding following suggestions deriving from demonstrators’ experiences can be given:

- Organise short internal educational workshops dedicated to critical issues (e.g. unnecessary idling wastes fuel).
- Adapt training to vehicles in the fleet.
- Embed recognition/rewarding in company’s policy.
- Implement driver training (theoretical and practical) followed by periodical personal discussions and follow-ups. It is highly recommendable that drivers are trained in eco-driving.
- It makes sense for bigger companies to have eco-driving expertise in available within company. You might think about educating few of your best drivers to become in-house instructors and to train other drivers.
- Adapt driver training to your company and culture: organize workshops in forms of quality circles and make drivers come up with suggestions on how to improve fuel consumptions. Work together with the drivers and motivate them to implement their suggestions and be sure to measure the results.
- Consider organising workshops for fleet managers, maintenance and procurement staff in order to improve the awareness on importance of managing fuel consumption
- Develop company specific recognition and rewarding schemes for the drivers.

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- If you encounter initial resistance from drivers address it with positive approach and with proven results even reluctant drivers will start cooperation over time,
- Constant periodical feedback to the drivers can function as a motivational impulse even without recognition and rewarding scheme.
- Regular information on CO₂ emissions and correlated savings can function as a strong motivational element,
- Drivers must be familiar in details with their vehicle's technical characteristics in order to use them in the most efficient way. Make knowledge on vehicle's specifics a part of the training (e.g. drivers might not be using the retarder properly).
- In order to identify the influence of vehicle on fuel consumption you might consider exchanging vehicles among drivers.

6.4.4 Vehicles and Maintenance

One of the important factors with regard to fuel consumption are vehicles that comprise the company's vehicle fleet. Matching vehicles' specifications to type and extent of operations should be one of the priorities of management and procurement. However it was observed that not enough attention is given to the vehicles' specification on detailed level which could result in higher fuel consumption. In order to match the vehicle's specifications on an optimal level, it is vital that management is familiar with operational requirements in detail.

Other recommendations are as follows:

- Procurement should be well planned as vehicle's specifications must correspond to the operational requirements.
- Transmissions - the fitting of automatic or semi-automatic gearboxes in vehicles according to specifics of the operations can lead to a reduction in fuel use and vehicle wear and tear, as well as less driver fatigue.
- Improved maintenance (more frequent air filter cleaning, rigorous controls of appropriate tire pressure) can lead to lower fuel consumption.
- Group your vehicles on basis of vehicle characteristics (manufacturer, engine power, transmission etc.), load and route characteristics and compare fuel consumption within the same group.
- Emphasize appropriate settings of air deflectors according to type of trailer if your vehicles are operating at higher velocities.

Based on the experiences learned from project demonstrators external support to the companies has proven vital. While top management and fleet managers are highly interested to apply fuel saving measures they are usually overburdened with daily operations or other important issues and simply lack the time to search for the relevant information. With strong support from the project partners and other external experts demonstrators were able to plan and implement different fuel saving measures. The same goes for the recognition and rewarding schemes.

When the company is deciding to implement RECODRIVE measures or similar interventions it is rather important that it starts with implementation of few simple interventions and to keep in

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on the smaller scale. Once proven successful the measures should be applied to the whole vehicle fleet.

It is also advisable to learn from other fleets that have already implemented similar interventions in order to avoid repeating possible mistakes or just to prepare for the obstacles that might appear along the way.

It is safe to say that careful planning based on analysis relevant for planned intervention will generate better results with fewer complications.

7 Disclaimer

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