

9th BESTUFS Workshop
23RD – 24TH January 2003
Budapest, Hungary

Mrs. E.Y. de Gooijer

“PEAK: Places – People – Products, solutions for evening and night distribution”.

(24th January)

CONTENT of the speech:

Introduction

I Places and People

II Products

- 1. PEAKprogram**
- 2. The 10 projects of the PEAKprogram**
 - a. Knowledge and locations**
 - b. Product innovations (technical solutions)**
- 3. The practice**
 - a. Drivers behaviour**
 - b. Retailers and their possibilities**
 - c. Conclusions**

(The speech goes in combination with a sheet-presentation.)

[Sheet 1]

Introduction

Ladies and gentlemen.

My name is Elly de Gooijer. I am working at the **Ministry of Transport** in the Netherlands, more precisely at the **Road Haulage Division**.

I am responsible for the **long-term PEAKprogram** that makes it possible for hauliers to load and unload their trucks with goods during the evening and night without making too much **noise**.

You may think: What does she mean? Is there a problem?

Well,

[Sheet 2]

I Places and People.

First I like to concentrate on **places and people**.

The Netherlands pays a great deal of attention to the **welfare of its citizens**. Where necessary, this is enforced through legislation. As a result of ever-increasing economic growth and the 24-hour demand for products by consumers, shops have been allowed to stay open longer in the evening since the end of the last century, according to the law: '**Trading Hours Act**'.

This Act gives shopkeepers possibilities to stock their shops later in the evening. The hauliers, in trying to avoid congestion on the roads, travel to shops for restocking before the rush hour in the morning, or in the evenings after the rush hour, or even in the night.

Other facts are that people in the Netherlands are encouraged to **live above shops** and that growth of the **housing market** has been stimulated by building buildings closer together. These facts have led to more people suffering from **disruptions** created by transport activities in residential areas.

Moving transport activities to the early morning, the evening and even the night can lead to noise nuisance at times when those people living in the vicinity could experience such noise as being even more disruptive.

[Sheet 3]

In order to prevent this, national legislation was drawn up in the Netherlands in 1998 in the law:

Order in Council “Decree on environmental management in respect of the retail trade and trade businesses”. This law has been set up by the Ministry of Housing, Spatial Planning and Environment, to combat noise nuisance and stipulates that the noise emission generated when loading and unloading goods must comply with strict noise emission standards.

This law is mainly concerned with noise levels caused by retailers and trading businesses loading and unloading their goods in **built-up areas** during the period from the evening to the early morning.

- Between 23:00 and 07:00, a maximum PEAKlevel of 60 dB(A) applies;
- Between 19:00 and 23:00 a maximum PEAKlevel of 65 dB(A) applies, always measured according to the “fast” meter reading on the outside wall of a house where noise nuisance is experienced;
- Between 07:00 and 19:00 (during the day), a general exemption from PEAKnoise levels when loading and unloading goods applies.

Standards based on PEAK/equivalent noiselevels have also been set for activities other than the loading and unloading of goods. The values of these have been included in the Order in Council.

The law will apply to **approximately 65,000 companies**. For the record, this relates not only to **urban logistics**, but also to **distribution in residential areas**. In other words, not only to city centres, suburbs and shopping centres, but also to towns where shops are located.

A new aspect of the regulation is the fact that municipalities in the Netherlands have been given the authority to **deviate from the standards**, either by setting higher standards or by lowering the standards.

At that moment, **supply traffic could not comply with the noise requirement of 65 dB(A)** in the evening and 60 dB(A) during the night. A great effort was therefore required to reduce noise levels for supply traffic and loading and unloading activities in residential areas.

And.....therefor we now come to the products.

II Products

1. PEAKprogram

Given the materials currently used, industry and commerce could not comply with the stricter standards outlined in the said Order in Council in 1998. Even not when drivers showed an excellent behaviour when talking, shouting, throwing crates, putting on the radio and turning the refrigeration on and off.

This table shows actions which result in the following PEAKnoise **without** using 'quiet' equipment and **without** 'quiet' behaviour:

	PEAKlevel at 7.5 m (dB(A))
• Slamming the door	74 approx.
• Driving up, manoeuvring and driving away with the distribution vehicle	67 – 83
• Using the load hatch	65 – 92
• Moving rolling containers or pallet trucks over the load floor of the vehicle	74 – 85
• Transport refrigeration kicking in	70 – 78
• Moving rolling container or pallet trucks over paved surface	72 – 81
• Fastening load-locks	
• Fastening or removing the on-board fork lift	77 – 82
• Driving the on-board fork lift	75 approx.
• Retailer's customers pushing shopping trolleys	53 – 77

If homes are located more than 7.5 meters away, the rule of thumb is that every time the distance is doubled, the noise level is reduced by 6 dB.

As you can see in the table above, there was a lot to develop to reduce the PEAKlevel of all described elements, necessary during good-deliveries.

The Ministry of Housing, Spatial Planning and Environment, the Ministry for Economic Affairs and the Ministry for Transport, Public Works and Water Management introduced together a **long-term PEAKprogramme 1999-2004 in order to bring about the necessary technical adjustments**, by tackling the source to the means of transport, the **usage of materials** when loading and unloading goods and the **loading-unloading locations**.

In addition to concentrating on efforts to achieve a situation where it was possible to comply with the PEAKstandards, this programme also took into account aspects such as **habitability, economic feasibility and technological innovations.**

[Sheet 6]

2. The 10 projects of the PEAKprogram

The programme comprised 10 main projects.

*The first two projects on the list fulfil a **supporting** role for all the others and do not fall under product innovation.*

1. *transfer of knowledge to relevant companies;*
2. *encouraging quiet behaviour;*
3. optimal loading and unloading **locations;**
4. low-noise distribution **vehicles up to 7.5 tons;**
5. low-noise distribution **vehicles over 7.5 tons;**

[Sheet 7]

6. low-noise **refrigerated transport installations;**
7. low-noise **portable forklift trucks;**
8. noise reduction in **roll containers, pallet trucks, hand pallet trucks;**
9. noise reduction in **shopping trolleys;**
10. **electric propulsion** or a combination of electric and diesel or gas propulsion.

By the end of 2002, we had found technical solutions for most of the main projects which complied with the standards for loading and unloading stipulated in the Order in Council. **Two alternatives** – shopping trolleys and the propulsion noise of the trucks themselves - complied with the evening-standard. (The trucks themselves pose the greatest problem, in particular, the propulsion noise. In the course of 2002 DAF had found a solution to comply to the standard for the evening.) **All other alternatives** even complied with the night-standard.

Even where technical solutions have been found, this still does not mean that companies can use these low-noise solutions, because products must be available on the market at **economically sound prices**. Market introduction, therefore, poses the next problem.

In most situations we do not deal with a pure Dutch but with the international transport market.

Which brings us to the next subject:

[Sheet 8]

International Transport Market

When trying to make adjustments to the means of transport, the Netherlands faces the problem that the **truck industry** is an international one. This industry will not look into reducing noise levels if current legislation does not require it and PEAKnoise levels have unfortunately not (yet) been set on a **Europe-wide basis**. At the same time, however, the problem of noise nuisance *is* an international problem, in particular, in the many large (European) urban areas.

From a **social, environmental and economic** point of view, it will therefore be a step in the right direction if this problem is to be tackled at **European level** in order to give an **incentive**, from within **European policy**, to the **truck industry to manufacture the technical possibilities**, [which have in the meantime been tested in the Netherlands,] on a large scale for the European international market.

Action?

My question to you is: “do you agree that the described noise-problem is an European problem?”

If your answer is YES?

“What are you going to do in your country and on European level to start a program to solve this noise-problem for your citizens?”

[Sheet 9]

The solutions for evening and night distribution

a. **Knowledge and locations**

Transfer of knowledge to relevant companies

Companies that develop and improve their own products often lack **specialized knowledge** about the causes of the noise production and the possibilities for reducing and **dampening** such noise. The transfer of knowledge is however essential so as to guarantee good implementation.

[Sheet 10]

The following aspects are taken into account in **project 1**:

- transfer of knowledge about how low-noise solutions can be manufactured;
- transfer of knowledge between product suppliers and product buyers;
- transfer of knowledge in the direction of the hauliers;
- transfer of knowledge in the direction of the retail businesses;
- transfer of knowledge in the direction of the municipalities.

[Sheet 11]

The range of (still increasing) ‘quiet’ equipment

‘Quiet’ solutions have been developed within the PEAKprogramme for all parts that made too much noise and have all been tested for noise production according to a **set measuring procedure**.

[Sheet 12]

In addition to solutions for **‘quiet’ equipment**, there are also **PEAKguidelines** for designing a **‘quiet’ loading and unloading location**. These have been developed in **project 3: optimal loading and unloading locations**.

There are now several solutions on the market for various facilities. A **brochure** containing an overview of the current guidelines for quiet constructions is available (CROW-publication 171, website: www.crow.nl)

b. Product innovations (technical solutions)

<i>No.</i>	<i>Project</i>	<i>No.</i>	<i>Product innovations</i>
3	Optimal loading and unloading locations	3.1 3.2 3.3 3.4	Infrastructure Ground surface Structural adjustments Guidelines
4	Distribution vehicles < 7.5 tons	4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8	Motor, inlet, exhaust Differential and gearbox Compressed-air system Brake system Warning system Tailboard Loading space Locking / doors
5	Distribution vehicles > 7.5 tons	5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8	Motor, inlet, exhaust Differential and gearbox Compressed-air system Brake system Warning system Tailboard Loading space Locking / doors
6	Low-noise refrigerated transport installations	6	Refrigerated transport installations
7	Low-noise portable forklift trucks	7	Forklift trucks
8	Noise reduction in roll containers and hand pallet trucks	8.1 8.2 8.3	Roll containers Hand pallet trucks Ground surface
9	Noise reduction in shopping trolleys	9	Shopping trolleys
10	Electric or hybrid propulsion	10.1 10.2	Electric propulsion Hybrid propulsion

Interactions

<i>Independent innovations</i>	<i>Optimisation</i>	<i>Optimisation</i>
	interaction between →	and →
Motor, inlet, exhaust	infrastructure/ground surface	portable forklift truck
Differential and gearbox		roll containers
Compressed-air system		pallet truck, hand pallet truck
Brake system		shopping trolleys
Warning system	Tailboard	roll containers
Locking/doors		pallet truck, hand pallet truck
Refrigerated transport installations		
Electric propulsion	loading space	roll containers
Hybrid propulsion		pallet truck, hand pallet truck
Structural adjustments		

There are now many quiet products as mentioned in the tables above on the market.

A **brochure** containing an overview is available (see website www.PIEK.org).

[Sheet 13]

Project 4: Low-noise distribution vehicles up to 7.5 tons

There are **approximately 80,000 trucks** in the Netherlands. Of these, **between 16,000 and 18,000** are used for urban logistics. Moreover, during the last few years light goods vehicles (vans) have been used more and more for smaller-scale distribution. There are approximately 627,000 light goods vehicles in the Netherlands.

When loading goods onto and unloading goods from distribution vehicles, the following noises are characteristic:

1. noises produced when driving up to and away from the shop and manoeuvring the distribution vehicle;
2. banging noises produced when goods are loaded or unloaded;
3. noises produced when driving goods onto or off the truck and the tailboard.

[Sheet 14]

A large number of product innovations jointly contributed to make distribution vehicles with a total weight of less than 7,500 kg quieter.

[Sheet 15]

Noises affected include:

- driving noise,
- noise produced when using the brake system,
- the warning system,
- the tailboard,
- the loading space,
- the locks and
- doors.

The main aim of project 4 was to develop **noise-optimised components** and to combine these into a low-noise distribution vehicle. This included the following product developments:

[Sheet 16]

- product development of practical retrofit measures and small design adjustments to reduce the **rolling noise over the tailboard**;
- product development of
 - rubber buffers,
 - door closers,
 - insulated pins and
 - catches,
 - low-noise locking systemsetc.
which can be fitted as ‘add-ons’;
- research into universally applicable (also for retrofit) enlarged absorption **dampers for compressed-air brake systems**;
- information about how to make better adjustments to and maintain **brake systems**;
- encouraging people to change to **disc brakes**;
- encouraging people to carry out regular maintenance so as to be able to guarantee to a large extent the desired noise reduction in certain products (doors, hinges etc.);

[Sheet 17]

- product development of a **durable loading floor system** (e.g. a springy sandwich layer in the floor) and **spring system for walls and locking systems** to reduce the noise produced by rolling, bumping and tugging roll containers and pallet trucks;

[Sheet 18]

- Although the PEAK programme does not make specific provision for light goods vehicles, solutions for these had also to be found.

[Sheet 19]

It is expected that the **new generation of intelligent speed limiting devices**, which are available since last year (2002), will make a considerable contribution in this regard.

[Sheet 20]

[Sheet 21]

[Sheet 22]

[Sheet 23]

[Sheet24]

Project 5: Low-noise distribution vehicles over 7.5 tons

Trucks over 7.5 tons are mostly used for large-scale transport assignments over long distances. However, even these vehicles are also used for **urban logistics**. In addition to solo trucks with a **superstructure**, this segment often also uses **trucks with semi-trailers**.

It is estimated that 20,000 motor vehicles and 5,000 semi-trailers are used in this segment. The product innovations are the same as for distribution vehicles under 7.5 tons, the difference being a matter of dimensions.

A large number of product innovations **jointly contributes** to make distribution vehicles with a total weight of more than 7,500 kg quieter.

[Sheet 25]

Noises affected include driving noise, noise produced when using the brake system, the warning system, the tailboard, the loading space, the locks and doors.

[Sheet 26]

The main aim of this project was to develop noise-optimised components and to combine these into a low-noise distribution vehicle.

[Sheet 27]

Characteristic noises when loading and unloading goods with distribution vehicles of 7.5 tons and above are the following:

[Sheet 28]

- driving up to and away from the shop and manoeuvring noises of the distribution vehicle;
- **banging noises** when unloading goods;

[Sheet 29]

- applied research into a different and better aimed **warning signal (reverse signalling)** and **volume regulation**;
- noises produced when driving goods off and onto the truck and over the tailboard;
- noise produced by the cooling units.

Now I like to say something about:

[Sheet 30]

Project 6: Low-noise refrigerated transport installations

When restocking shops, vehicles equipped with **refrigerated installations** are often used. A refrigerated installation can be mounted on a solo truck with a superstructure (an estimated 40,000 on the market), but also on a **semi-trailer** (an estimated **5,000** on the market). The most important source of noise is the motor, because the motor is responsible for generating the refrigeration.

[Sheet 31]

Peak noise emission levels of 69 and 74 dB(A) have been measured for **conventional refrigerated installations**. Since the refrigerated installation is often mounted on the drop-end of the truck and since the front of the truck often faces the residential area when loading and unloading, noise nuisance can be expected at bedroom level in particular. The required noise reduction was 10 to 20 dB(A).

The aim was to reduce the production of noise by the refrigerated installation mounted on the **superstructure of the truck**. There are already a number of alternatives to conventional, diesel-powered refrigerated installations on the market. These alternatives have been tested in respect of their applicability. There was not much difference between the various technologies when viewed in terms of the various areas of application.

[Sheet 32]

The necessary requirements depended on the type of the refrigerated installation.

When using *diesel units* (separate diesel propulsion for the compressor), the following were important:

- making a special effort to apply more low-noise diesel motors;
- reducing inlet and exhaust noises;
- optimising the noise-insulation capability of the existing casing;
- using a lower running speed, e.g. under 1,000 rounds per minute (rpm);
- developing a quieter condenser (less current noise).

When using *generator units* and *hydraulic units*, a reduction of noise has mostly been achieved compared to diesel units. In this regard, attention was paid to:

- reducing the noise produced by the engine of the truck as joint source of the noise;
- possibly using eutectic refrigeration when stationary;
- developing a quieter condenser (less current noise)

[Sheet 33]

Project 7: Low-noise portable forklift trucks

When loading and unloading heavy goods (e.g. building materials), a so-called **portable forklift truck** is often used. This forklift truck is mounted on the back of the truck/semi-trailer. It is estimated that there are approximately **1,500** of these **portable forklift trucks** in the Netherlands. The use of a portable forklift truck in residential areas is limited. It is normally **builder's merchants** and drinks **wholesalers** who make use of this type of forklift truck. This was therefore a limited problem.

[Sheet 34]

The **portable forklift truck** is fitted with a **diesel engine**. Noise is mostly produced when unloading the forklift truck, using the forklift truck (bumping noise created when bumping the forks, driving noise as a result of propulsion) and mounting the forklift truck on the truck. Peak noise emission levels in excess of 90 dB(A) have been measured.

The required noise reduction was considerable: 20 to 30 dB(A). In order to achieve this noise reduction, the following noise-reducing measures were possible:

- developing a low-noise diesel engine;
- reducing inlet and exhaust noise;
- optimising the noise-insulation capability of the existing casing;
- using a lower running speed.

[Sheet 35]

Project 8: Noise reduction in roll containers, pallet trucks, hand pallet trucks

Hand pallet trucks are used when it is necessary to unload goods transported in pallets on the cargo truck.

During the last few years, more and more goods are being stocked by using **roll containers**. Roll containers and hand pallet trucks are therefore 2 essential links in the supply chain.

It is estimated that **100,000 hand pallet trucks** are used in the Netherlands.

The number of **roll containers** is estimated at **1,100,000 to 1,500,000**.

One problem experienced with both products is the fact that they come in so **many versions**, which made it very difficult to develop uniform “low-noise solutions”.

[Sheet 36]

The aim was to reduce the noise produced by **roll containers** and **hand pallet trucks**, not only when they are in motion, but also when they are handled.

Noise was generated, for example,

- when the container wheels and fork wheels roll over an uneven surface,
- when the forks are bumped against the ground, pallet walls and cargo and
- when various component parts of the roll containers bump and rattle.

Finding better ways of fastening the cargo also deserved more attention.

Achieving the required noise reduction in respect of hand pallet trucks required a great effort. A noise reduction of approximately 30 dB(A) was required. In the case of roll containers, a noise reduction of more than 20 dB(A) has been achieved in order to comply with the peak noise level provisions stipulated in the Order in Council.

[Sheet 37]

As regards the improvement of the *roll containers*, the following had to be taken into account:

- using elastic wheels;
- reducing the play between the wheel and fork bearings;
- using springy elements where the wheel meets the superstructure;
- preventing rattling in the wall frames;
- using a noiseless floor;
- using elastic bumpers;
- fastening the cargo.

As regards the improvement of the *hand pallet trucks*, the following had to be taken into account:

- using elastic wheels;
- reducing the play between the wheel bearings and the bars of the lifting mechanism;
- adding construction damping to the sheet metal work;
- adding elastic bumpers to the fork points and angular points.

[Sheet 38]

Project 9: Noise reduction in shopping trolleys

Even though shopping trolleys are not used during the restocking process, they are nevertheless the last link in the logistical chain. Not only the shopping trolley itself, but also the shopping inside the trolley generates PEAK-level emission noise. As regards shopping trolleys, it is only necessary to comply with the PEAK standard of 65 dB(A), since shops in the Netherlands are not open before 7:00 or after 23:00.

Approximately **600,000 shopping trolleys** are in use at shops in the Netherlands.

Shopping trolleys generate PEAK-level noise. This is mainly caused when transporting the shopping over uneven **paving** and returning the shopping trolley to the **trolley bay**. A total noise reduction of 10 to 20 dB(A) has been achieved.

[Sheet 39]

The effort to reduce noise levels of **shopping trolleys** is geared towards:

- using elastic or spring-loaded wheels;
- using constructions where there is little room for movement;
- attaching rubber edges around moving parts;
- attaching coatings and rubber bumpers;
- mounting the basket of the shopping trolley on springs could also be considered.

[Sheet 40]

Project 10: Electric propulsion

or a combination of electric and diesel or gas propulsion

We have already discussed **vehicles** under the projects 4 and 5.

Project 10 looks specifically at electric and/or **hybrid propulsion**.

It is expected that this type of propulsion will lead to much **noise reduction in future**.

Electric propulsion is substantially quieter than internal combustion engines.

Hybrid propulsion, (i.e. a combination of electric and more conventional diesel or gas propulsion) can also serve as an alternative to an internal combustion engine when it comes to noise reduction.

Compared to full electric propulsion, hybrid propulsion offers the advantage of a greater range of action in that it is possible to switch over to conventional propulsion outside urban areas.

The aim of this project was to develop **noise-optimum electric or hybrid propulsion** which can be applied to distribution vehicles as add-ons regardless of the make.

The required effort must be geared towards:

- choosing suitable electric propulsion. It was decided to concentrate on add-ons, given the deadlines specified in the long-term PEAK programme and the short development period associated with this;
- taking care with the design of the assembly of the various parts in the vehicle;
- acoustically optimising the current signal for the frequency regulator, e.g. with a passive filter and a power converter;
- designing a low-noise transmission;
- possibly developing an additional noise package.

A hybrid vehicle - combination of electric and the more conventional diesel - has been developed by DAF.

The hybrid vehicle involves a considerable additional price. This means that there is still no market-ready product.

It is expected that the hybrid vehicle will be market-ready at the earliest in four years' time.

Given the above, it should **not be concluded** that the development of a hybrid truck is not meaningful.

With the arrival of the **fuel cell**, a part of the problem outlined above will be solved.

[Please, for more information website: www.piek.org]

[Sheet 41]

3. **The practice**

a. **The importance of the driver's behaviour!**

The 'quiet' solutions have been measured by a 'fast' meter reading 7.5 metres from the source at a reference height of 1.2 metres above the road surface.

If the distance to the front of a home is smaller during loading/unloading, the permitted PEAKlevels may still be exceeded. So acquiring 'quiet' equipment is no guarantee that noise problems will not occur. The driver's behaviour during loading and unloading is very important.

No matter how quiet the equipment is,

- if the driver does not handle it well or
- leaves the radio on during loading and unloading,
- when he is not talking but shouting and
- is throwing crates,

all efforts will be in vain.

If the driver is going to a 'problem location', proper instructions are very important. Aside from being aware of the problem, he must also know how to act.

Therefore in **project 2 'encouraging quiet behaviour'**, special courses are being developed aimed at various groups: drivers, supervisors (mid-level management) and warehouse managers.

[Sheet 42]

b. **Retailers and their possibilities**

What does the law in practise mean for the **retailers**, the **citizens** and the **municipalities**?

It is advisable for the retailer to have good relations with local residents in any event, so that solutions can be sought constructively to clear up or even prevent any complaints.

If the law cannot be respected at a particular location between 7.00 pm and 7.00 am, the facility holder (retailer), municipality and transporter must find a solution **together**.

The following steps can be taken to achieve 'quiet' loading and unloading:

[Sheet 43]

STEP 1: LOCATION AND BEHAVIOUR

Retailer

- First, find out where the problems are;
- Adapt the loading/unloading location, e.g., by loading/unloading within the premises, installing a canopy or rearranging the parking area;
- Instruct loading/unloading staff;
- Purchase ‘quiet’ shopping trolleys.

Retailer and municipality

- Adapt the loading/unloading location (canopy, acoustic enclosure)
Adapting paving (seamless paving, covers);
- Noise insulation in affected homes.

Driver

- Instructions to driver:
- Driver/logistical planner must know the law (Order in Council) and municipal requirements for each location well;
- Driver must know the resources he has been given;
- Driver must know the consequences of loading/unloading location for the loading/unloading noise he produces in the given circumstances (within premises/canopy/public road/private property/paving type);
- Driver must decide how and where to put the vehicle for ‘quiet’ loading and unloading based on the three points above.

[Sheet 44]

STEP 2: USING ‘QUIET’ EQUIPMENT

Retailer and transporter; requirements for transporter

If too much noise is still being produced at a location despite the measures indicated in step 1 during evenings and nights:

- The retailer can arrange with the transporter for loading and unloading to occur using only ‘quiet’ equipment.

If this is insufficient you can ask for:

[Sheet 45]

STEP 3: MUNICIPAL SUBSEQUENT DEMAND

Retailer and municipality

If the driver is unable to load and unload within the requirements despite efforts and the use of 'quiet' equipment at a loading/unloading location that has been adapted as much as possible, there is still the following possibility:

- The retailer can ask the municipality, with reasons, to set a higher limit by 'subsequent demand'.

[Sheet 46]

STEP 4: IF STEPS 1 TO 3 ARE INSUFFICIENT there is 1 thing left

Transporter and retailer can do.

If too much PEAKnoise is still being produced despite the measures in steps 1 to 3, loading and unloading at night, and sometimes in the evening, may not be possible at that specific location. The only remaining option is:

- Loading/unloading during the day period, which is exempt from PEAKstandards.

Now I come to my:

c. **Conclusions**

[Sheet 47]

**‘Quiet’ loading and unloading is the joint responsibility of:
transporters/drivers,
retailers *and*
municipalities.**

And as the Netherlands needs support to make the truck-industry to produce ‘quiet equipment’ according to all solutions found:

[Sheet 48]

**The EU can support ‘QUIET’ loading everywhere.
And so:
improve quality of life of all EU-inhabitants!**

[Sheet 49]

Information about PEAK can be found on the Internet at www.piek.org.