

**Paper:****Reducing use of studded winter-tyres in Drammen, Norway**

Cand. Scient. Astrid H. Amundsen (TOI)

**Abstract**

The air quality in Norwegian cities is poor, especially during the winter season and early springtime. EU's required air quality for 2005 and 2010 may be hard to meet, if further measures are not implemented.

One of the targets in this connection is to increase the use of non-studded tyres during the winter season to 80 percent in major Norwegian cities. This will reduce the level of  $PM_{10}$  in the air.

The main focus in this paper is to discuss the possibility of accomplishing the target, and how to do this. The focus of this study are on which persons use studded tyres, why they do it, and possible measures to persuade them into changing to non-studded tyres.

The paper summarizes the result of a survey of 1500 respondents in Drammen (city south of Oslo) and 250 in each of the 5 neighbourhood municipalities.

**Introduction**

It is a national and an EU target, that within 2005 the daily-mean-concentration of  $PM_{10}$  must not exceed  $50 \mu\text{g}/\text{m}^3$ , more than 25 times (max 7 times in 2010). To meet this challenge special measures have to be implemented.

In Norway it is mainly during the winter and early spring season the  $PM_{10}$  level in the air is high. It is due to wood burning (heating) during the cold season and pollution from road traffic (exhaust, road-wear and suspension of road-side particles). Since particles from wood burning are released at roof-height, most of these particles are spread, and do not affect humans in the same degree as particles from exhaust and road-wear can.

Measures of air quality level in Oslo show that on the five most polluted days, road-wear and suspension account for 84-92 percent of the street-level pollution (Larssen and Hagen 1997).

Air pollution from traffic and other sources have influence on people's health. The effects vary from minor unpleasantness to increased death-rates. A study by Rosendahl (2000) indicates that about 2200 death in Norway are hastened due to long-time-exposure of  $PM_{10}$ . About 40 of these deaths occur in Drammen. People exposed to long time exposure of air pollution are more susceptible to infections. Investigations also show that allergic reactions can increase in polluted areas (Kolbenstvedt m fl 2000).

In Norway carowners are required to use winter tyres providing adequate road holding during the winter season. This is tyres with a minimum of 3 millimetres of groove depth, and is either with or without metal studs. If an accident occurs and the car are not equipped with the right kind of tyres, the insurance may be reduced. Most Norwegian carowners therefore have to sets of tyre, one set for the winter and one set for the

summer. In Drammen less than 5 percent had just one set of tyres. Tyre with metal studs have been and are still the most used winter tyre in Norway on passenger cars.

Calculations (Rosendahl 2000) indicate that road-wear mainly due to the use of studded tyres, leads to production of about 2000 ton of PM<sub>10</sub> each year in Norway. Reducing the use of studded winter tyres can alter this.

Figure 1 gives an example of PM<sub>10</sub> production with different use of non-studded tyres. The calculation is based on 10 000 vehicles (of which 10 percent heavy vehicles), and show the production of PM<sub>10</sub> (in kg per kilometre dry road) at different speed levels. So, when the traffic speed is 80 km/h about 6,5 kg of PM<sub>10</sub> is produced on one kilometre of road, when the use of non-studded tyres are 60 percent. If 80 percent of the traffic used non-studded tyres, about 2,5 kg of PM<sub>10</sub> will be produced. This give a reduction of 4 kilos of PM<sub>10</sub> daily, if you manage to reduce the use of studded tyres from 40 to 20 percent (at a mean speed of 80 km/h).

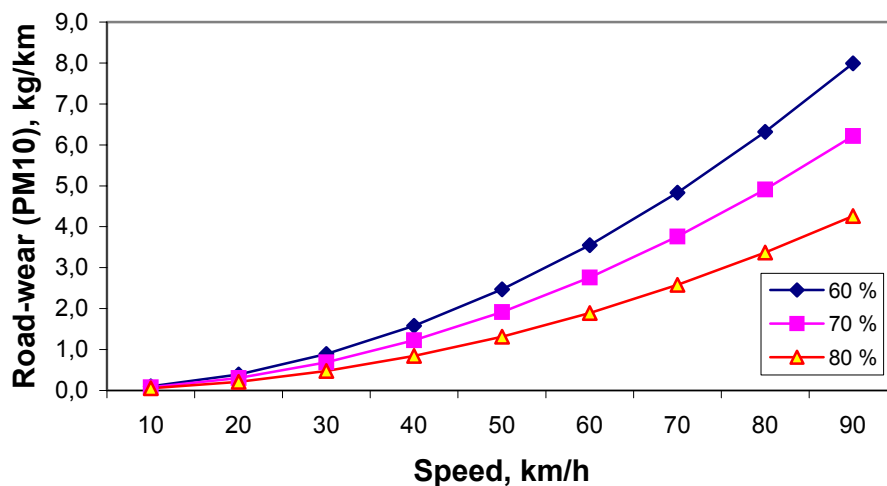


Figure 1: PM<sub>10</sub> from road traffic, when use of non-studded tyres are 60, 70 and 80 percent. PM<sub>10</sub> in kg per km road. Daily. Traffic volume 10 000 vehicle daily, dry road-surface. The share of heavy vehicles is 10 percent. Based on NILU's road-dust-model (SFT and SSB 1999).

In Oslo it has been tried to measure the effect of reduced use of studded tyres on the  $\mu\text{g}/\text{m}^3$  level of PM<sub>10</sub> in the air, but just some indications based on city-background exists. According to Bartonova et al (2002) measures indicate that by reducing the use of studded tyres by 10 percent, the mean PM<sub>10</sub> level are reduced with 1  $\mu\text{g}/\text{m}^3$ . But PM<sub>10</sub> is mainly a problem at street level, and at the moment laboratory measurements of PM<sub>10</sub> production (with/without studs, different surface conditions and speed levels) are used as basis for implementing the targets.

To improve the air quality in the major Norwegian cities, and to reach national and EU air quality requirements, one of the goals is to reduce the use of studded tyres to max 20 percent during wintertime.

So far none of the large Norwegian cities has reached the target. Table 1 show the use of non-studded tyres in the period 1999-2003, in four major Norwegian cities. Oslo implemented a studded-tyre-charge a few months before the 2000 counting, and abolished it in 2001 when the target was within reach.

Table 1: Use of non-studded tyres during the winter season in four Norwegian cities. In percent (traffic). Source: Norwegian Road Administration 2003

	1999	2000	2001	2002	2003
Oslo	49,7	68,7 <sup>A, B</sup>	79,4 <sup>B</sup>	68,0	71,6
<b>Drammen</b>	<b>51,6</b>	<b>54,1</b>	<b>50,9<sup>A</sup></b>	<b>59,9</b>	<b>58,7</b>
Trondheim	32,8	35,6	37,2	55,5 <sup>B</sup>	58,9 <sup>B</sup>
Bergen	62,9	70,6 <sup>A</sup>	72,1	68,9	67,6

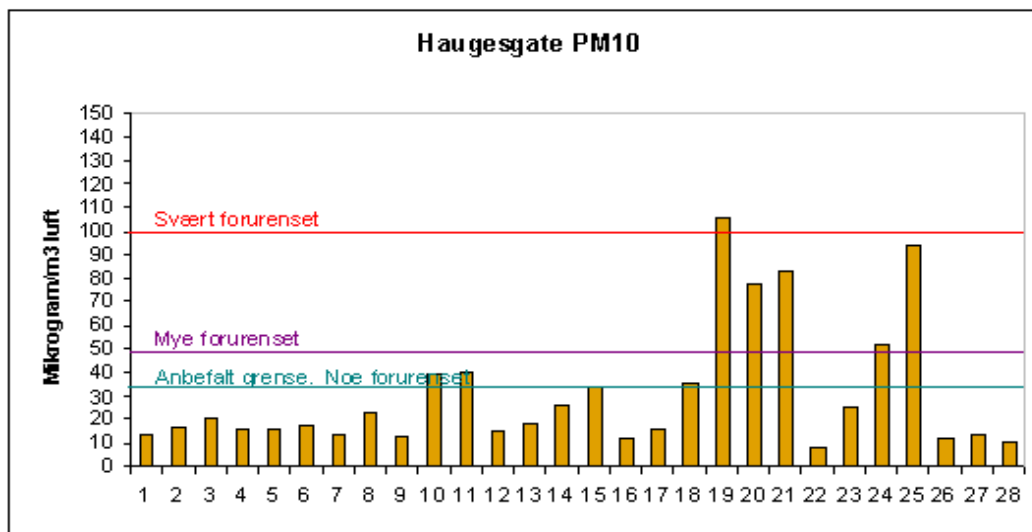
Counted in February. A - Subsidizing purchases of non-studded tyres with 120 EURO. B - Charge of 120 EURO for the use of studded tyres implemented.

How to reach the targeted 80 percent use of non-studded winter tyres is up to the city council in each city. The city of Drammen (city south of Oslo with 56 500 inhabitants) asked TOI to investigate how to reach the targeted 80 percent, and try to determine how inhabitants would react to a studded tyre charge. This paper will describe the investigation, which took place in the first months of 2002.

### The study

One of the targets of the municipality of Drammen (south of Oslo, Norway) is to increase the use of non-studded tyres during the winter season to 80 percent before 2004. The main reason for this is to improve the air quality in the city of Drammen.

Figure 2 show the PM<sub>10</sub> level in the air at the monitoring station at a central street in Drammen (Hauges gate) in February 2002. On five of these days the PM<sub>10</sub> level in the air was higher than the 50 µg/m<sup>3</sup> recommended.



TØI-rapport 570/02 Kilde: Drammen

kommune 2002.

Figure 2: Daily-mean-concentration ( $\mu\text{g}/\text{m}^3$ ) of  $\text{PM}_{10}$  at the monitoring-station in Hauges gate (street in Drammen). Measurement from February 2002. Source: Drammen kommune 2002.

1500 respondents in Drammen and 250 in each of the neighbourhood municipalities participated in the survey. The study was executed as a telephone interview, and the sample unit was randomly selected. The respondents all had a driving licence, and owned or disposed a car for personal use. The questionnaire included the following themes:

- Knowledge of the target percent for the use of non-studded tires, and air quality forecast
- Grading of the air quality in Drammen, and consequences on everyday life
- Winter maintenance of roads in Drammen
- Feelings of unsafety as a driver on winter roads.
- The importance of difficult driving conditions (snow or ice) on car use
- Ownership of cars, type of tyre, driving distance
- Consequences of a charge (120 EURO per year) for use of studded tyre

## Results

To find out if it is possible to reach the non-studded tyre target, and how to do so, we needed to find out who uses studded tyres during the winter, and their reasons for doing so. Then we could find out what needed to be done to change these people's minds.

The results from this and another Norwegian study (Vaa 1997) indicate that cars with non-studded tyres are used more than what is average for a car with studded tyres.

Because of this the percentage use of non-studded tyres in traffic is somewhat higher than the number of cars with non-studded tyres indicate.

When the driving distances are taken into account, the use of non-studded tyres in Drammen was calculated to be 63 percent and the average for the 5 neighbouring municipalities was 51 percent.

In this study we are interested in the use of non-studded tyres in Drammen. Therefore the use in Drammen had to be given a higher weight than that of the neighbouring municipalities. The weighting is based on the amount of driving taking place in the centre of Drammen (table 2). Based on that, we estimated that about 60 percent of the traffic in Drammen is undertaken with non-studded tyres.

*Table 2: Percentage of driving using non-studded tyres. The winter of 2001/2002, in two years, and if a charge for the use of studded tyres is initiated. For car owners in Drammen and in neighbouring municipalities, and weighted for the amount of driving taking place within Drammen. In percent*

	Private cars		Private cars	All vehicles
	Drammen	Neighbouring	Weighted* Drammen	Weighted Drammen
Today (2002)	63	51	60	62-64
In two years	71	58	68	70-72
With charge	74	62	72	74-76

Source: TØI report 570/2002

\* In the weighted percentage the non-studded percentage for Drammen has been given a weight more than double the neighbouring municipalities. The weighting is based on the amount of driving within the centre of Drammen.

The respondents were also asked if they intended to buy new winter tyres within a two-year period. If those persons who said they would change tyre actually do so, and in fact chose the type of tyre they say, about 68 percent of the traffic (by private cars) will be on non-studded tyres in 2004.

The percentages in table 2 include private cars. If buses, taxis and heavy-duty vehicles are included in the calculation the percentage will be 2-4 percent higher than if just private cars are included.

So if the municipality of Drammen implements a charge for the use of studded tyre from the winter 2002/2003 it would seem that the target for 2004 is within reach.

Among the persons with studded tyres on their car, there was a majority of females and persons above 60 years, who said that they would feel unsafe if they had to use non-studded tyres during winter season. There was also a tendency for the male drivers to drive longer distances, and therefore gain more experience driving on winter roads. On the other hand, female drivers more often deliver the children to schools and kindergarten, and do the shopping, which often include driving on smaller community roads. These roads are more likely to have a snowy or icy road surface, and difficult situations may occur.

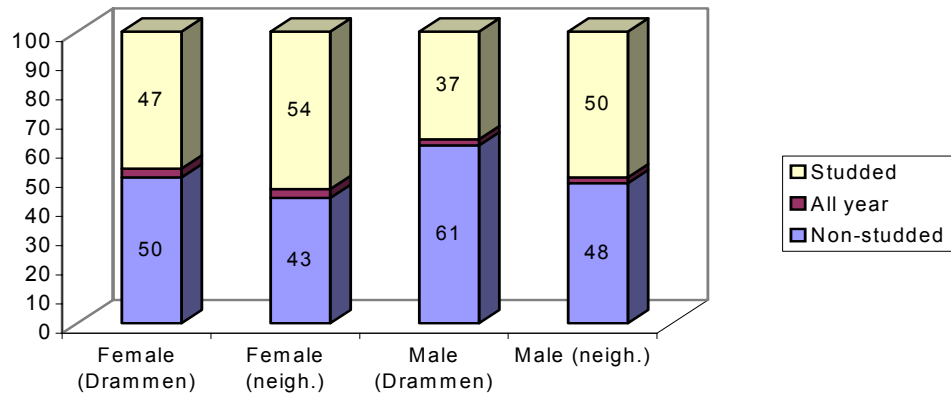


Figure 3: Type of tyres used during the winter season in Drammen and the neighbour municipalities. By gender. In percent.

Traffic safety is a main factor for a lot of people when considering changing tyres, and which type to choose. Table 3 give an example of some of the views of today's users of studded tyres, divided into to groups: the ones who state that they will change to non-studded tyres if a charge for the use of studded tyres is implemented, and the ones who state that they will keep the current type of tyres "no matter what happens".

The two groups differ in attitude to some important questions. The survey shows that the ones considering changing to non-studded tyres use the car more than the ones who do not intend to change tyre type. They also rate the winter maintenance of the roads higher than the "will not change" group, as well as saying that they do not feel unsafe as a driver on winter roads.

50 percent of the users of studded tyres said that they often would have felt unsafe as a driver during the winter season, if they had to change to non-studded tyres. Just 5 percent of the persons who had non-studded tyres on their car, said that they "often" felt unsafe. There was no significant difference between the users of studded/non-studded tyres with respect to the number of persons who stated that they often chose not to use the car due to difficult driving conditions.

Table 3: Attitudes towards winter maintenance of winter roads in Drammen, level of service on winter roads, and unsafety as a driver on winter roads. Inhabitants in Drammen with studded tyres on their car. In percent

	Attitudes	Intentions to change tyres	
		Yes, change to non-studded tyres	No, would still use studded tyres
Did not use the car the day before the interview*		10	16
Agrees that the use of studded tyres “to a main degree” is of importance for air pollution**		27	11
Think that it “often” or “some times” is hard to drive as usual on winter roads if they don’t use studded tyres**		37	80
Would “often” or “some times” have felt unsafe as a driver, if driving on non studded tyres**		50	85
Happens “often” or “some times” that they decide not to use the car, if the roads are covered with snow/ice		23	26
Satisfaction with the clearing of the road (snow) in the centre of Drammen (mean- on a scale from 1 to 6)**		4.3	3.9
Satisfaction with salting and sanding in the centre of Drammen (mean- on a scale from 1 to 6)**		4.1	3.8
	<b>Number of respondents</b>	<b>247</b>	<b>422</b>

\*\* significant at 1% level \* significant at 5% level

## Discussion

In Drammen as in other Norwegian cities it seems necessary to implement a charge for the use of studded tyres, if one should reach the targeted 80 percent use of non-studded winter tyres. Oslo reached their target after implementing a charge, but the percentage using non-studded tyres fell by almost 10 percent after the charge was abolished, see table 1.

So, even if Drammen implemented a temporary charge (120 EURO per year) it may not be enough to maintain this level of use for a longer period of time. Both to reach the targeted use and to keep this level one need to know why some people prefer using studded tyres during the winter season, and to find possible solutions to their reasons for doing so.

This study indicate that only 5 percent of the users of non-studded tyres “often” feel unsafe when driving on winter roads, while as many as 50 percent of the studded tyre users state that they would have felt unsafe driving on non-studded tyre. In addition to this, the users on non-studded tyres did not leave their car at home on days with difficult

driving conditions more often than the users of studded tyres. Target group oriented information with this kind of information may be important to give to the ones who are sceptic about non-studded tyres. On the other hand, it is important to take their fear for real.

Offering upgrading-courses in skid driving, improving winter maintenance of the roads and informing why it is important to reduce the use of studded tyres might therefore also be important.

To improve the air quality in Drammen and other Norwegian cities it is important also to implement other measures than just reducing the use of studded tyre. Special vehicles for vacuuming and washing the roads are being tested out in different cities and some cities plan to reduce speed limits on the major driveways. Concerning the other major source of PM<sub>10</sub> in the cities, wood-burning, some cities have subsidised purchases of new and more energy-efficient fireplaces (and wood-burning stoves) in private households.

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