Vind, Christian Leif Aarestrup

Fra: Niels Eigtved [nce@webspeed.dk]
Sendt: 5. november 2009 17:18
Til: MST Miljøstyrelsens hovedpostkasse
Emne: Luftforurening

Ved gennemlæsning af høringsmaterialet til udkast af 26. oktober d.å. til "Luftkvalitetsplan for partikelforurening i København og Frederiksberg" samt dele af baggrundsmaterialet – f. eks. Miljøprojekt Nr. 1021 2005 – har det forundret os, at der tilsyneladende ikke omtales luftforurening fra togtrafik. Specielt forureningen fra de dieseldrevne lokomotiver, der fortsat kører gennem København og i lange perioder holder parkeret med gående motor på Østerport Station, ville vi gerne have nærmere belyst.
Hvad er forklaringen på den manglende omtale?

Med venlig hilsen,

Elsebeth & Niels Eigtved
Trondhjemsgade 2., 2.tv.
København Ø

Vind, Christian Leif Aarestrup

Fra: Philip Douglass [Phil@Douglass.dk]
Sendt: 6. november 2009 12:31
Til: MST Miljøstyrelsens hovedpostkasse
Emne: Høringsvar: Luftkvalitetsplan for partikelforurening i København og Frederiksberg

Tillad mig at skrive på mit modersmål, Englisk:

I'm pleased that the EU has rejected the Danish government's application to again postpone compliance with air quality standards. Substantial improvements to our air quality are long overdue.

I read the draft "Luftkvalitetsplan", and I have a number of comments:

0. The email address to send hearing replies (mst@mst.dk) is not clearly visible on the web-page that contains the draft document. I found the address in an advertisement in our local newspaper.

1. Tabel 3, "Oversigt over kilder til luftforurening", shows that particles from brakes, and "vejstøv" are significant sources, but the "Reduktionsmulighed" column does not make any sense:

"Ingen reelle reduktionsmuligheder: Omlægning af trafik til mindre veje vil være imod hele princippet i den danske byplanlægning."

I think it is clear that the emissions from brakes are directly proportional to the total amount of motor traffic in the city and completely unrelated to whether the traffic is on large or small roads. A real possibility for reducing emissions from this source is to reduce the total motor traffic volume.

2. The section, "Kommunale indsatser for at reducere luftforurening" says: "Kommunerne råder ligeledes over egne virkemidler til at begrænse vejtrafikken, særligt i byområderne. Her kan nævnes ... parkeringsrestriktioner"

I think this statement is misleading because it does not mention that Kommunerne are greatly discouraged from raising parking fees by the National government's so-called "Skattestop". This policy sends revenues from higher parking fees to the national government rather than to the Kommunerne, and has directly prevented politicians in København from raising parking fees to balance supply and demand, and improve our air quality.

3. I take issue with the Miljøministeriet treating the problem of particles from traffic in isolation from the other urgent problems excessive motor traffic has created: NOx pollution, CO2 emissions, health-damaging traffic noise in around 25% of all homes, traffic accidents as a leading cause of death.

An integrated approach to these problems can, in my opinion, only come to the conclusion the best way to address all of them is to internalize these social costs so the polluters pay the real cost of their lifestyle. Unfortunately, it is clear that the Danish government is more interested in protecting motorist from paying the real costs of their overconsumption, than they are in protecting the health of me and my family.

Finally, I would like to express my disappointment to live in a country that plans to have urban air quality as unhealthy as legally allowed. I think 35 days exceeding healthy emissions levels is 35 days too many!

--
-Philip Douglass

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NORDISK ALUMINAT

Miljøstyrelsen
Strandgade 29
1401 København K

Att.: Katja Asmussen

Kalundborg den 9. november 2009

Luftkvalitetsplan for partikelforurening i København og Frederiksberg

Nordisk Aluminat A/S er en dansk producent af calciummagnesiumacetat (CMA), som i flere EU-projekter er blevet brugt til begrænsning af partikelforurening. Såfremt det ikke lykkes at nedbringe partikelniveauet tilstrækkelig med de metoder, som er beskrevet i luftkvalitetsplanen, tillader vi os at gøre opmærksom på, at CMA kan anvendes til at nedbringe bidraget fra vejstøv, som jf. tabel 3 udgør 8,8 %.

I 2004 blev der, som del af et EU-LIFE projekt om partikelforurening, gennemført forsøg i Stockholm med udspredning af en 25 % vandig opløsning af CMA. Forsøgene viste en reduktion af PM_{10} på 35 %. Resultaterne er beskrevet i "Studies of some measures to reduce road dust emissions from paved roads in Scandinavia" af Michael Norman og Christer Johansson (kopi vedlagt). Der er ligeledes gennemført forsøg i Klagenfurt i Østrig (se evt. www.feinstaubfrei.at og www.life-cma.at). Nordisk Aluminat A/S har leveret CMA til forsøget i Stockholm samt til en del af forsøgene i Klagenfurt.

CMA binder det støv, som ligger på vejbanen. I Miljøstyrelsens "Bilag til Danmarks meddelelse om udsættelse af fristen for overholdelse af grænseværdier for PM_{10} i Danmark i medfør af artikel 22 i direktiv 2008/50/EF" af 27. oktober 2008 står, at et stort bidrag til TSP kommer fra ophvirvlet støv fra kørebanen. I Stockholm regner man med, at ca. 25 % af PM_{10} fra vejstøv skyldes ophvirvling. Det er en af årsagerne til, at det giver gode resultater på PM_{10} at binde vejstøvet. Denne metode kan naturligvis ikke stå alene, da nogle af de mindste partikler er meget lang tid om at sedimentere – eller aldrig når det. Støvbinding med CMA kan med fordel anvendes som supplement ved spidsbelastninger - fx ved specifikke vejrforhold og på udsatte vejstrækninger som H.C. Andersens Boulevard.

CMA er et miljøvenligt produkt. Det kan også anvendes som tømiddel og vores produkt (*ICE-AWAY og DUST-AWAY*) er Svanemærket som dette. Der findes endnu ingen miljømærkekriterier for støvbindere, men det anvendes i samme eller mindre mængde til støvbinding som til glatførebekæmpelse. Selvom bidraget fra vej- og havsalt ikke tæller med i årsmiddelværdien for PM_{10}, så kan de ligeledes blive reduceret, hvis støvbinding og glatførebekæmpelse sker med samme produkt på de udvalgte vejstrækninger.

Vejdirektoratet har for en del år siden regnet sig frem til, at CMA var en meget dyr løsning. Vi kan oplyse, at CMA ikke koster mere end fx calcium- eller magnesiumklorid, som også bruges til både støvbinding og glatførebekæmpelse – men med CMA undgås korrosionsskader fra klorid.

I er naturligvis velkommen til at kontakte Nordisk Aluminat A/S for mere information.

Venlig hilsen

NORDISK ALUMINAT A/S

Thomas Stilling
Adm. direktør

Kopi sendt til:
Københavns Kommune: Overborgmester Ritt Bjerregaard og Teknik og Miljøborgmester Klaus Bondam
Frederiksberg Kommune: Kommunaldirektør Suzanne Aaholm og By- og Miljødirektør Jacob Nordby
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Studies of some measures to reduce road dust emissions from paved roads in Scandinavia

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Abstract

In this paper we present quantitative assessments of different measures to reduce the PM10 levels along streets in Scandinavian cities based on tests in Stockholm. The effect of the use of studded tyres on concentrations in a street canyon has been quantitatively assessed using monitoring data. A 10% decrease in the fraction of studded tyres was estimated to reduce the weekly average street canyon PM10 levels (due to local road abrasion) by about 10 $\mu g\,m^{-3}$ if only daytime and dry street conditions were considered. These results are obtained by correlating the increase in PM10 levels during autumn with the increased use of studded tyres. Since the share of studded tyres is around 75% in Stockholm during wintertime, the peak springtime PM10 levels that occur during dry road conditions would be substantially lower if the use of studded tyres were regulated. Intense sweeping or washing of the pavements resulted in marginal reductions (<10%) and will have no important influence on the PM10 levels with the methodologies and working machineries tested here. Application of calcium magnesium acetate (CMA, Ice Away, as 25% water solution) on the road surface of a highway during dry conditions resulted in an average reduction of around 35% in the daily PM10 averages. The most efficient way to reduce PM10 levels in the long-term and for a large area is to reduce the use of studded tyres, while application of CMA may be efficient to reduce peak levels, which frequently occur during dry road conditions in spring.

Keywords: PM10; Studded tyres; Sweeping of roads; Dust binding; Road wear

1. Introduction

Long-term measurements have shown high levels of PM10 in Stockholm City and along busy roads and highways in Sweden during winter- and springtime. The monthly averages in Stockholm has been observed to be above 80 $\mu g\,m^{-3}$ for March and April during 1999–2004 and daily averages extending above 200 $\mu g\,m^{-3}$ for several days during each year (Johansson et al., 2004). The annual averages have been between 30 and 50 $\mu g\,m^{-3}$ for three busy streets, shown in Table 1, which is close to the European Union (EU) environmental quality standards of 40 $\mu g\,m^{-3}$ for PM10. According to the EU directive (1999/30/EG) the daily averages of PM10 should not exceed 50 $\mu g\,m^{-3}$ for more than 35 days during each year. As shown in Table 1 this limit has been exceeded at all three streets during the years 1999–2004. The main reason for the exceeding values is the local road dust generation from the roads (Omstedt et al., 2005). Long-range transport is of some importance for the annual mean levels but of marginal importance for the springtime levels. Likewise vehicle exhaust emissions have been found to contribute only marginally to the observed PM10 levels (Omstedt et al., 2005) in contrast to many European cities outside Scandinavia where it may account for 50% or more of the local PM10 levels (Querol et al., 2004). Other important factors are meteorological parameters such as dry road surface and wind speed but also traction sanding of the streets (Kupiainen et al., 2005). Similar problems with elevated PM10 levels as in Stockholm have been reported from several other Scandinavian cities like Helsinki (Pohjola et al., 2002; Laakso et al., 2003), Oslo (Lützenkirchen and Lutnaes, 2005), Trondheim and Bergen (Laupsa et al., 2005) as well as Gothenburg and Lycksele (Areskoug et al., 2004).

No significant decreasing trend has been observed in the PM10 levels during the last 5 years in Stockholm in contrast to several other European cities (Van Dingenen et al., 2004). A recent review on health effects of coarse particles offers evidence of significant impacts on human health and concludes that special consideration should be given to regulate coarse particles separately from fine particles (Brunekreef and Forsberg, 2005). In order to reduce the PM10 levels during winter- and springtime in the Stockholm City area (and other Scandinavian cities) it is necessary to quantitatively assess the importance of different measures. In this study we use measurement data to evaluate the importance for PM10 levels by reducing the use of studded tyres, increased street sweeping, increased street washing and the usage of calcium magnesium acetate as road dust binding material.

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Table 1
Annual mean PM10 levels and number of days exceeding 50 $\mu g\,m^{-3}$ each year at three street canyon measuring sites in Stockholm

Year	Hornsgatan		Norrlandsgatan		Sveavägen	
	Annual average $\mu g\,m^{-3}$	Number of days $>50\,\mu g\,m^{-3}$	Annual average $\mu g\,m^{-3}$	Number of days $>50\,\mu g\,m^{-3}$	Annual average $\mu g\,m^{-3}$	Number of days $>50\,\mu g\,m^{-3}$
2000	46.2	103				
2001	47.1	84				
2002	47.5	101	36.8	66	41.3	74
2003	45.5	73	36.8	80	39.3	75
2004	41.4	80	33.1	63	33.0	59

Annual mean EU limit value is 40 $\mu g\,m^{-3}$ and the number of days allowed to exceed 50 $\mu g\,m^{-3}$ is 35.

2. Methods and site description

The air quality in the Stockholm area is continuously monitored by the Stockholm Environment and Health Administration. The monitoring network includes air quality measurements at three busy streets in central Stockholm and one station at roof level within the city. For PM10, automatic instruments tapered element oscillating microbalance (TEOM), Rupprecht and Pataschnik) equipped with PM10- and PM2.5-inlets are used. Two electrical ball-valves are used to automatically switch between the two inlets. NO_x is monitored with Chemiluminescence analyzers (Thermo Electron). Number of vehicles of different types and their speed is measured continuously.

Hornsgatan is oriented from east to west and the traffic intensity is about 35,500 vehicles per day during weekdays. The measurements are performed on the northern side of the street. The measuring site at Hornsgatan is described in detail by Gidhagen et al. (2004a).

Norrlandsgatan is a 15 m wide two lane one-way street surrounded by 24 m high buildings on both sides. The street is directed from north to south and the traffic intensity is about 10,000 vehicles per day during weekdays. The measurements are performed on the western side of the street 2 m above street levels.

Sveavägen is a 33 m wide four lane street surrounded by 20 m high houses on both sides. The street is directed from north to south and the traffic intensity is about 30,000 vehicles day during weekdays. The measurements are performed on the western side of the street 2 m above street levels.

Identical instruments for NO_x and PM10/PM2.5 as for the street sites are located at the urban

background station Rosenlundsgatan, about 600 m SE of Hornsgatan and at 30 m height. At this site traffic emissions on nearby streets have limited influence of the concentrations and it may therefore be regarded as representative for the urban background.

Meteorological parameters including wind speed, wind direction, temperature, temperature vertical profile and relative humidity are measured at roof level in central Stockholm. The wetness of the street surface was monitored at Norrlandsgatan using a simple electrical resistance wire during January 2003 until March 2004.

Additional measurements were performed along a four lane highly trafficked highway (around 60,000 vehicles per day) between Stockholm City and Arlanda airport at Vallstanäs north of Stockholm during Feb–May 2004. The highway is directed north to south, and surrounded with open fields. The same site was used in 2003 and is described in Gidhagen et al. (2004b). Three sites along the highway were established for automatic PM10 measurements. They were placed about 1 km apart and located 2 m from the road on the eastern side. Around each station was a 1 km stretch treated in different ways. One road stretch (S) was left untreated as control, on one stretch (E) the road surface was washed with high-pressure water systems and on the third road stretch (N) the road surface was treated with calcium magnesium acetate (CMA) to prevent suspension of road-dust. Meteorological parameters such as wind speed, wind direction and temperature were monitored right next to the highway. Before any treatment was made the differences in PM10 concentrations between the three stations were less than 5% of the daily averages if only westerly winds were considered (cf. Table 3).

3. Results

3.1. Influence of studded tyres

During each spring (February–April) a significant increase in the PM10 levels have been observed for three street stations in Stockholm, as presented in Fig. 1. There are no indications of elevated NO_x levels during winter and springtime (c.f. Fig. 1) showing that the elevated PM10 levels during the same period not is caused by variations in meteorological conditions like the frequency of stable conditions. During each fall there is also an increase in the fraction of studded tyres used, while the opposite situation occurs during springtime as shown in Fig. 1. Studies in laboratories using a road simulator by Gustafsson et al. (2005) have shown that the use of studded tyres increased the PM10 emission 40–50 times in comparison to winter tyres without spikes. Similar studies by Kupiainen et al. (2005) have also shown that particle emissions increases several times with the use of studded tyres but it also further increased if traction sand were applied to the pavement. Kupiainen et al. (2003) further reported that the average fraction of the particle emissions from asphalt was around 75% compared to 25% from the sand, which is similar to results obtained in real world urban studies in the city of Hanko in Finland (Kupiainen and Tervahattu, 2004). The observed time-lag between the increase in use of studded tyres and maximum PM10 levels in Fig. 1 is explained by the fact that the emission of road dust, independent of source, mainly takes place during periods with a dry road surface (Johansson et al., 2006), which is more common during springtime. This is clearly exemplified in Fig. 2 where elevated PM10 levels only occur when the street was dry. For the same time periods

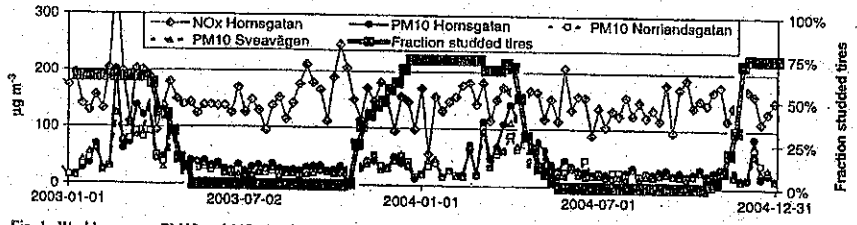

Fig. 1. Weekly average PM10 and NO_x levels together with the fraction of studded tyres on light duty vehicles in Stockholm City.

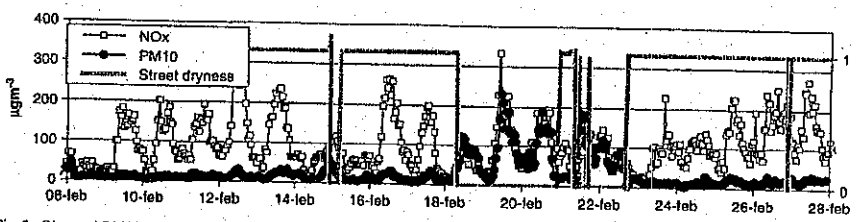

Fig. 2. Observed PM10, NO_x and street wetness at Norrlandsgatan during February 2004. The street sensor signal is one during wet street conditions and zero during dry conditions.

no difference between wet and dry conditions is observed in NO_x.

Our hypothesis is that local emissions of dust particles from the streets originate from:

(i) direct emissions during dry conditions due to abrasion of the road surface by studded tyres,
(ii) direct emissions during dry conditions due to wear (mainly by studded tyres) of traction sand or wear of accumulated dust (formed due to wear during wet periods),
(iii) vehicle induced suspension of accumulated dust or traction sand during dry conditions. Accumulation of dust on the roads occurs mainly during wet periods and can be due to (increased) wear due to studded tyres, but is also further increased if traction sand is added.

For measurements in street canyons it may be difficult to distinguish between the three different source mechanisms. In this study we have tried to minimize the influence from traction sanding and suspension, i.e. mechanism ii and iii, as well variation in the background levels in order to estimate the source strength for PM10 due to road wear from vehicles equipped with studded tyres, i.e. mechanism (i). The fraction of light duty vehicles using studded tyres is manually counted every week from October through May in central Stockholm with around 500 vehicles being counted each time. We assume the fraction to be constant during the weeks as well as homogeneously distributed within the Stockholm City area. The importance of the fraction of studded tyres on the PM10 levels was assessed by using the street station measurements. Local background levels (taken from measurements at roof level at Rosenlundsgatan) have been subtracted from all PM10 data in order to minimize the influence of other sources than the local traffic. Data during hours with wind directions (WD) that bring roof level air down to the stations have been excluded (southerly winds i.e. $135 < WD < 225$ for Hornsgatan and easterly winds i.e. $45 < WD < 135$ for Norrlandsgatan and Svenvägen) as described by Gidhagen et al. (2004a). Also only hours with dry street surface conditions during daytime (07:00–19:00) were included. Dry street surface conditions were estimated using the street surface wetness measurements at Norrlandsgatan, together with no precipitation for the three previous hours and a relative humidity <90%. During October through early December 2003 the weather was unusually warm with the temperature rarely below zero (in total 5 days during October and November). Due to this no traction sand was applied on the streets until the beginning of December. In Fig. 3 we present the weekly average PM10 levels in Stockholm in relation to the fraction of studded tyres for the period without any traction sand on the streets. Note that the data in Fig. 1 correspond to all road conditions, whereas only daytime and dry condition is included in Fig. 3. The results from least squares linear regressions (shown in Fig. 3 and Table 2) shows that during autumn an increase in the fraction studded tyres with 10% causes an increase in the weekly PM10 levels of between 10 and 11 $\mu g\,m^{-3}$ during daytime with dry road conditions with $r^2 = 0.60$–0.64. Only small variation between the streets could be observed even though the amount of traffic on the streets differs. No correlation between fraction of studded tyres and NO_x levels is observed ($r^2 < 0.2$ for all streets, not shown), supporting the indication that the increase is not caused by the variation in meteorology.

The decrease in PM10 levels during the spring 2004 also showed a linear correlation with the use of

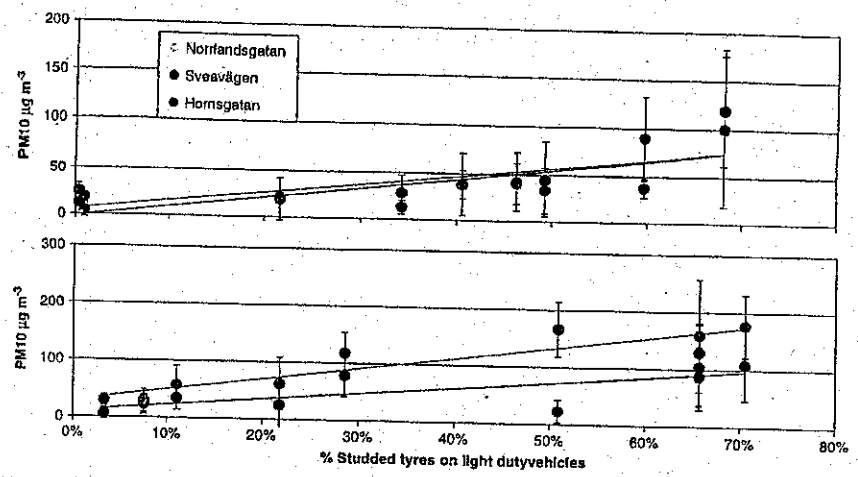

Fig. 3. Scatter plot of weekly average PM10 levels in Stockholm City against fraction of studded winter tyres on light duty vehicles. Upper panel: data from October–December 2003. Lower panel: data from February-May 2004. Only data during dry street conditions daytime has been included. The vertical bars denote the standard deviation.

Table 2
Observed relationships between weekly PM10 levels and fraction of studded tyres used shown in Fig. 3

	October–December 2003			March–May 2004		
	Relation	r^2	N	Relation	r^2	N
Hornsgatan	$PM10 = 101.3*a_{st} + 6.2$	0.60	207	$PM10 = 202.3*a_{st} + 30.3$	0.87	312
Sveavägen	$PM10 = 111.7*a_{st} - 1.5$	0.64	275	$PM10 = 119.8*a_{st} + 11.6$	0.67	216
Norrlandsgatan	$PM10 = 106.8*a_{st} + 0.8$	0.64	275			

a_{st} denotes the fraction of light duty vehicles using studded tyres. N is number of data points included.

studded tyres (Fig. 3 lower panel). During winter and spring traction sand was applied on the street pavement with in general the same frequency at all studied streets. Later in spring also cleaning of the streets took place but the decrease was observed well before the first cleaning (data points above 40% studded tyres were before any street cleaning). The PM10 levels at Sveavägen decreased with almost the same linear relationships during springtime as the increase in autumn. On Hornsgatan however, a $20\,\mu g\,m^{-3}$ decrease for a 10% decrease in the fraction of studded tyres was observed which was about double as during autumn. The result from this study clearly shows that there is a strong relationship between the use of studded tyres and the PM10 levels in Stockholm. The exact quantity of the relationship is difficult to estimate due to other influencing factors. For example although no traction sanding was applied for the autumn the particles emitted from the abrasion by the studded tyres might to some part accumulate on the streets and later cause increased emissions due to the so called sandpaper effect. Another important factor is the length and duration of the dry surface period used for the study. In the study by Omstedt et al. (2005) they found that the emission of particles

increases if the wet period before the dry period was longer since the abrasion continuously occurs, but that the actual emission into the air only occurs when the surface later gets dry.

Studies in Oslo by Bartonova et al. (2002) also showed a linear relationship between the use of studded tyres and the observed PM10 concentrations. The average wintertime PM10 concentration decreased with $1\,\mu g\,m^{-3}$ for a decrease of 10% in the use of studded tyres and up to $2\,\mu g\,m^{-3}$ if only days with low wind speed and no precipitation was considered. Even though, the different way of analysing the data between this study and the one by Bartonova et al., is not directly comparable, the finding of a linear relationship between PM10 concentration and the use of studded tyres supports the findings in this study.

3.2. Intense sweeping of the streets

The use of street sweeping has been proposed to be a way to reduce the emission of particulate matter from pave roads (Chow et al., 1990). In Stockholm tests with intense sweeping of the road surface have been performed in order to evaluate the possible reduction of the PM10 levels. During 10–18 March and 10–22 April 2003, the street at Norrlandsgatan was cleaned every night by mechanical street sweepers (Scania, Broddway). The PM10 levels were compared with Sveavägen that has the same orientation and similar impact from meteorological factors, like wind direction, wind speed and road surface dryness. Fig. 4 shows the daily ratio of the PM10 levels at Norrlandsgatan and Sveavägen. The results show that no statistically significant reduction could be observed at Norrlandsgatan during the periods with intense sweeping. Instead in most cases the results shows an increase in the PM10 at Norrlandsgatan during days with sweeping. A comparison between the spring 2003 and 2002 shows that the average PM10 levels as well as the number of days with PM10 levels exceeding $50\,\mu g\,m^{-3}$ was even higher during the spring 2003 compared to 2002, when the street was swept at normal frequency (two times each spring). Our results are in agreement with several other studies. For example a recent study for winter condition in Nevada by Gertler et al. (2006) found a significant increase in the PM10 emissions after sweeping of the roads. Both Kuhns et al. (2003) and Etyemezian et al. (2003) compared the PM10 emissions from paved roads that had been swept or vacuum cleaned with roads with no treatment in Idaho, USA. Nor the sweeping or the vacuum cleaning had any significant effects of the emitted PM10 levels. Fitz (1998) also concluded that street sweeping had no significant effect on the PM10 levels in California. A study in Taiwan by Chang et al. (2005) showed that intense sweeping together with high pressure water washing caused no reduction in the PM10 levels. In the study by Kantamaneni et al. (1996) they only observed a significant decrease in PM10 emission by sweeping if the relative humidity was lower than 30%.

However, although the sweeping did not cause any significant decrease in the PM10 levels for the following days, it might still on the long term have an effect. The removal of large gravels might prevent some of the formation of smaller PM10 particles later due to a reduction of the sandpaper effect. There exist also several more efficient machines and techniques for street sweeping and further studies are needed to see how they might affect the PM10 levels under different conditions like in this study but according to our knowledge no study has shown a significant decrease in PM10 due to street sweeping.

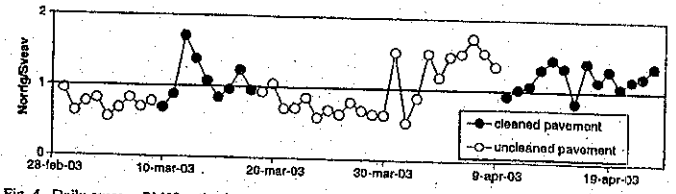

Fig. 4. Daily average PM10 ratios between Norrlandsgatan and Sveavägen during March and April 2003.

3.3. Washing with high pressure water systems

Test of the effects from washing with high-pressure water system was performed on the highway at Vallstanäs during Feb 20th until May 10th

2004. The verge next to the carriageway was washed during night time when the weather forecast predicted westerly winds and dry road conditions for the forthcoming day. Both the northbound and southbound lanes were washed. Visual observations in the early morning clearly showed that the verge was wet and there was also a clear reduction in visible dust and debris. Only periods with westerly winds (190–350 WD) together with dry road conditions were included in the analysis of the effects on PM10. An additional criteria was that only days with more than 5 h of westerly winds have been used to calculate the daily averages. In total 21 days fulfilled these criteria. Fig. 5 shows the ratio between the daily averages PM10 levels of the washed stretch (E) compared to the untreated stretch (S). During a majority of the days slightly lower concentrations were observed due to the washing. The reduction was more than 10% during 8 days but there were also two days with more than 10% higher PM10 levels at the washed stretch. During most days the observed effect was larger during the morning compared to the afternoon (not shown). The average reduction for the 21 days was 6% (statistical significant at 95% confidence interval), as shown in Table 3. For 10 out of the 21 days exceeded the daily average PM10 levels 50 $\mu g\,m^{-3}$ compared with 12 days for the untreated stretch. The reduced PM10 levels on the washed stretch could however, have been due to wetting of the road surface, which reduce suspension of dust, rather than actually removing PM10 particles. This could also explain the larger reduction during the morning hours. It is unlikely that PM10 from the untreated stretch would affect the PM10 measurements along the treated stretch since periods with only westerly winds are studied. Studies next to a highway by Kalthoff et al. (2005) showed that the traffic induced turbulence causes a significant transport perpendicular of the road and not only parallel.

The study in Taiwan by Chang et al. (2005) observed up to 34% reduction of TSP-concentrations by using both street sweeping and high pressure washing, but no reduction in PM10 was observed. Studies in Paris reported by Bris et al. (1999) found that the water jet cleaning procedure removal efficiency was around 25% for the total street deposit. They further conclude that the removal and collection efficiency for particles smaller than 50 μm probably was small.

3.4. Use of CMA

CMA (CMA, ICEAWAY, CMA 25) has been used as anti-freezing agent on roads in for example USA and Denmark. In our study CMA was applied to the streets as liquid solution (40 $g\,m^{-2}$, 25% water solution) along a highway at Vallstanäs on the northern road stretch (N) and on both the northbound and southbound lanes. Around 80% of the area of the carriageway was covered with CMA. The solution was applied during the same nights as the high pressure washing and the same criterion for selecting data was used as described above. The daily averages of the 21 days are compared with the untreated and the washed stretches in Fig. 5. The daily average PM10 concentration along the CMA treated stretch showed a reduction of between 15% and 60% compared to the untreated stretch. During the treated days the observed effect was lower in the afternoon, probably caused by removal of the CMA solution as it sticks to the tyres on passing vehicles and is being transported away from the studied stretch, but also due to evaporation. The average reduction in the daily average PM10 concentration was 35% (statistical significant at 95% confidence interval, Table 3). The reduction in the PM10 levels slightly increased if CMA was applied several days in a row. The daily average PM10 concentration exceeded 50 $\mu g\,m^{-3}$ during 3 of the 21 days for the CMA treated stretch compared to 12 days for the untreated stretch and 10 for the washed stretch, showing that CMA might be useful if the EU-limits are to be reached. The observed effect from the CMA application is also probably slightly underestimated compared to if the entire road would be treated, because of the removal on the tyres along the highway. The hygroscopic properties of the CMA solution might change with the relative humidity in the air, which in turn might influence the potential reduction in the PM10 levels. However, no consistent relation between the RH and the reduction in PM10 levels could be deduced from the observed data.

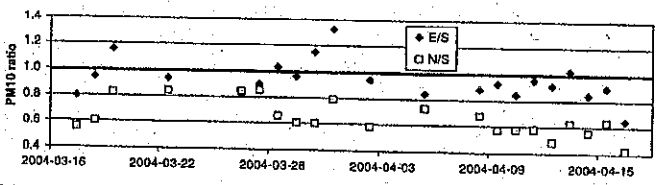

Fig. 5. Ratio of the daily average PM10 levels at the washed stretch (E) and the CMA treated stretch (N) compared to the untreated stretch (S) in spring 2004 at Vallstanäs.

Table 3
Average PM10 levels based on daily averages at Vallstanäs 2004

	No. days	Average daily averages			Average of daily ratios		Daily averages above 50 $\mu g\,m^{-3}$		
		S ($\mu g\,m^{-3}$)	E ($\mu g\,m^{-3}$)	N ($\mu g\,m^{-3}$)	E/S	N/S	S	E	N
Untreated period	26	42.0	43.4	42.6	1.05	1.03	7	7	7
Treated period	21	64.4	60.4	42.3	0.94	0.65	12	10	3

"S" is untreated, "E" washed and "N" CMA treated road stretch.

3.5. Suspension of road dust due to vehicle induced turbulence

Visually the carriageway on the highway was clean, indicating that dust and debris is not accumulated on a dry carriageway due to the turbulence caused by the passing vehicles. Experiments by Nicholson et al. (1989) and Nicholson and Branson (1990) have shown that up to 40% of the particulate material on a paved road could be removed by a single vehicle passage, but also that the removal is increased with driving speed. However, a substantial amount of dust and debris is accumulated on the verge or beside the highway. During a major field campaign along a German highway Kalthoff et al. (2005) found that traffic induced turbulence extended as far at 50 m away from the highway which may cause a significant suspension of the deposited dust on the verge, which causes elevated particulate levels next to the road. So far no studies have been made in Scandinavia to determine the impact on the observed PM10 levels of continuous emission of particles from road wear due to the studded tyres or from suspension (either from wind or from traffic) of previously deposited road dust under real road conditions.

At Vallstanäs (explorative) measurements were undertaken to evaluate the effect of dust suspension using a DustTrak™ (TSI model 8250) with PM10 inlet. The experiment took place on the 29th of March 2003, which was a dry and sunny day during the period with high use of studded tyres (Fig. 1) and a significant dust layer was present on the verge, although no traction sanding takes place along the Swedish highways. The DustTrak was placed in a passenger car with the inlet tubing out of the window on the right hand side. A second car was driven about 20 m ahead of the measuring car and both were driving about two meters into the verge. Behind the first car a dust cloud was produced from suspension of the deposited dust in the verge and the measuring car was driving inside this dust cloud. All three measuring sites were passed northbound as well as southbound with the driving speed of 70 $km\,h^{-1}$ and repeated with 90 $km\,h^{-1}$. The PM10 concentration was monitored at 1 Hz. The average concentration from the DustTrak together with a comparison to the TEOM stations is shown in Fig. 6. An absolute comparison of the PM10 levels between the TEOM and the DustTrak is probably not that accurate due to the different measuring techniques (up to a factor of two difference with direct comparison), but a relative comparison between the three different stretches should reflect the impact on PM10 levels. In general the highest concentrations were recorded along the untreated stretch (S) and the lowest along the washed stretch (E) consistent with the visual observation of available dust on the verge. As also clearly seen in

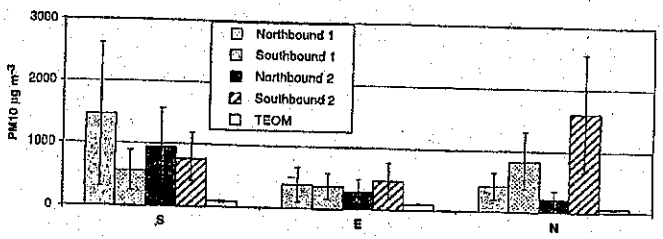

Fig. 6. The average PM10 concentrations along the highway 20 m behind a car that is driving in the verge of the highway. The driving speed for northbound 1 and 2 were 70 and 90 km h^{-1}, respectively, and the same for southbound 1 and 2. The vertical bars represent the standard deviation. "S" denotes the untreated stretch, "E" the washed stretch and "N" the CMA treated stretch.

Fig. 6 were the concentrations measured with the DustTrak much higher than the concentration at the fixed stations (using TEOM) at the same time. Thus, in contrast to what was observed based on the stationary PM10 measurements (small difference between the washed verge and the untreated verge, as shown above), the mobile data show significant difference between "potential" suspension of PM10 from the verge, depending on the amount of dust present. Based on this comparison we conclude that suspension of accumulated road dust on the verge has only marginal influence on the PM10 levels observed next to the highway during normal driving conditions (not in the verge). This study was performed during a dry period with a substantial dust layers on the verge and we hence conclude that the PM10 levels next to the highway mostly are caused by continuous road wear in the carriageway from studded tyres and not due to susupension of road dust from the verge.

4. Conclusions

In this study we present results from assessments of different measures in the Stockholm region in order to reduce the PM10 levels that are due to emissions of road dust. The weekly average PM10 levels were highly correlated with the fraction of studded tyres on light duty vehicles. The exact quantitative effect of reducing the share of studded tyres in the traffic in Stockholm depends on the meteorological conditions such as frequency of wet and dry periods and wind speeds. An estimate based on our regression analysis considering only dry periods during day time indicated 10 µg m^{-3} lower levels along the streets (street canyons) in Stockholm for each 10 percent reduction of studded tire use for weekly averages. A 50% reduction of the vehicles using studded tyres during winter would according to our measurement reduce the weekly daytime PM10 levels during dry conditions with around 30–40 µg m^{-3} during period with highest fraction of studded tyres. Such reduction would be of large importance if the EU-limit value for PM10 shall be achieved within Stockholm.

Application of CMA-solution to minimize suspension of PM10 from the road surface of a highway reduced the daily PM10 levels with on average 35%. The use of CMA can therefore be an effective measure to reduce peaks of the PM10 levels during dry road conditions.

Intense washing of the verge of the highway with high-pressure water systems resulted only in a marginal reduction of the PM10 levels (~6%). Intense sweeping of roads in the city centre was also found to have none or marginal effect on the PM10 concentrations.

Along a highway the influence from suspension of deposited dust from the verge was found to be of marginal importance. Instead particles from road wear of the carriageway due to the use of studded tyres are concluded to be the most important mechanism for the high PM10 levels observed along the highway.

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References

Areskoug, H., Johansson, C., Alesand, T., Hedberg, E., Ekengren, T., Vesely, V., Wideqvist, U., Hansson, H.-C., 2004. Concentrations and sources of PM10 and PM2.5 in Sweden. ITM-Report no. 110, Stockholm, Sweden. www.itm.su.se/reflab/dokument/

Bartonova, A., Larssen, S., Hagen, L.H., 2002. Trends in air pollution 1991–2001. Measures to reduce the PM10 concentrations in Oslo and Drammen, (only in Norwegian). OR 10/2002, NILU, Oslo, Ref. O-101093, ISBN: 82-425-1341-4.

Bertheisen, B.-O., 2003. The use of magnesium chloride as dust reducer at E6 through Tronheim, (only in Norwegian). Environment division, Report No. TM2003/2, Trondheim municipality, Environment division, Trondheim, Norway. ISBN: 82-7727-087-9.

Bris, F.-J., Garnuad, S., Apperry, N., Gonzalez, A., Mouchel, J.-M., Chebbo, G., Thévenot, D.R., 1999. A street deposit sampling method for metal and hydrocarbon contamination assessment. Science of Total Environment 235, 211–220.

Brunekreef, B., Forsberg, B., 2005. Epidemiological evidence of effects of coarse airborne particles on health. European Respiratory Journal 26, 309–318.

Chang, Y.-M., Chou, C.M., Su, K.-T., Tseng, C.-H., 2005. Effectiveness of street sweeping and washing for controlling ambient TSP. Atmospheric Environment 39, 1891–1902.

Chow, J.C., Watson, J.C., Egami, R.T., Frazier, C.A., Lu, Z., 1990. Evaluation of regenerative air vacuum street cleaning on geographical contribution to PM10. Journal of Air Waste Management. Assessment 40, 1134–1142.

Etyemezian, V., Kuhns H., Gillies, J., Chow, J., Hendrickson, K., McGown, M., and Pitchford, M., 2003. Vehicle-based road dut emission measurements (III): effect of speed, traffic volume, location, and season on PM10 roas dust emissions in the Treasure Valley, ID. Atmospheric. Environment, 37, 4583–4593.

Fitz, D., 1998. Evaluation of Street Sweeping as a PM10 Control Method. Final Report, South Coast Air Quality Management District contract AB2766/96018, 98-AP-RT4H-005-FR.

Gertler, A., Kuhns, H., Abu-Allaban, M., Damm, C., Gillies, J., Etymezian, V., Clayton, R., Proffitt, D., 2006. A case study of the impact winter road sand/salt and street sweeping on road-dust entrainment. Atmospheric. Environment, doi:10.1016/j.atmosenv2005.12.047.

Gidhagen, L., Johansson, C., Langner, J., Olivares, G., 2004a. Simulation of NO_x and ultrafine particles in a street Canyon in Stockholm, Sweden. Atmospheric Environment 38, 2029–2044.

Gidhagen, L., Johansson, C., Omstedt, G., Langner, J., Olivares, G., 2004b. Model simulations of NO_x and ultrafine particles close to a Swedish highway. Environmental Science and Technology 38 (24), 6730–6740.

Gustafsson, M., Blomqvist, G., Dahl, A., Gudmundsson, A., Ljungman, A., Lindbom, J., Rudell, B. Swietlicki, E., 2005. Inhalable Particles from the Interaction between Tyres, Road Pavement and Friction Materials. VTI publication No. 521, http://www.vti.se/EPiBrowser/Publikationer/English/R521.pdf.

Johansson, C., Norman, M., Omstedt, G., Swietlicki, E., 2004. Particulate matter in a city—sources, concentrations and evaluation of abatement measures (only in Swedish). Report No. SLB 4:2004. Environment and Health Administration, Box 8136, S-104 20 Stockholm, Sweden. http://www.slb.nu/slb/rapporter/pdf/pm10_4_2004_050117.pdf.

Johansson, C., Norman, M., Gidhagen, L., 2006. Spatial & temporal variations of particle mass (PM10) and particle number in urban air—implications for health impact assessment. Environmental Monitoring and Assessment, in press.

Kantamaneni, R., Adams, G., Bamesberger, L., Allwine, E., Westberg, H., Lamb, B., Clairborn, C., 1996. The measurements of roadside PM10 emission rates using atmospheric tracer ration techniques. Atmospheric Environment 30, 4209–4223.

Kalthoff, N., Bäumer, D., Corsmeier, U., Kohler, M., Vogel, B., 2005. Vehicle-induced turbulence near a motorway, Atmospheric Environment, doi:10.1016/j.atmosenv.2004.06.048.

Kuhns, H., Etyemezian, V., Green, M., Hendrickson, K., McGrown, M., Barton, K., Pitchford, M., 2003. Vehicle-based road dust emissions measurements-Part II: effect of precipitation, wintertime road sanding, and street sweepers on inferred PM10 emission potentials from paved and unpaved roads. Atmospheric Environment 37, 4573–4582.

Kupiainen, K.K., Tervahattu, H., Räisänen, M., 2003. Experimental studies about the impact of traction sand on urban road dust composition. Science of Total Environment 308, 175–184.

Kupiainen, K.K., Tervahattu, H., 2004. The effect of traction sanding on urban suspended particles in Finland. Environmental Monitoring and Assessment 93, 287–300.

Kupiainen, K.K., Tervahattu, H., Räisänen, M., Mäkelä, T., Aurela, M., Hillamo, R., 2005. Size and composition af airborne particles from pavement wear, tires, and tractor sanding. Environmental Science and Technology 39, 699–706.

Laakso, L., Hussein, T., Aarnio, P., Komppula, M., Hiltunen, V., Viisanen, Y., Kulmala, M., 2003. Diurnal and annual characteristics of particle mass and number concentrations in urban, rural and Arctic environments in Finland. Atmospheric Environment 37, 2629–2641.

Laupsa, H., Tonnesen, D., Krognes, T., Bruno, M., Walker, S.-E., 2005. Norway's Environmental condition, (only in Norwegian). NILU: OR 10/2005, Ref. O-104090, ISBN: 82-425-1647-2.

Lätzenkirchen, S., Lutnaes, G., 2005, Air quality in Oslo. Status 2004, (only in Norwegian). Oslo City, Health and Wealth Administration. http://www.helse-og-velferdsetaten.oslo.kommune.no/

Nicholson, K.W., Branson, J.R., 1990. Factors affecting resuspension by road traffic. Science of Total Environment 93, 349–358.

Nicholson, K.W., Branson, J.R., Giess, P., Cannell, R.J., 1989. The effects of vehicle activity on particle resuspension. Journal of Aerosol Science 20 (8), 1425–1428.

Omstedt, G., Johansson, C., Bringfelt, B., 2005. A model induced non-tailpipe emissions of particles along Swedish roads. Atmospheric Environment, doi:10.1016/j.atmosenv.2005.06.037.

Pohjola, M.A., Kousa, A., Kukkonen, J., Härkönene, J., Karppinen, A., Aarnio, P., Koskentalo, T., 2002. The spatial and temporal variation of measured urban PM10 and PM2.5 in the Helsinki metropolitan area. Water, Air and Soil Pollution 2, 189–201.

Querol, X., Alastuey, A., Ruiz, C.R., Artiñano, B., Hansson, H.C., Harrison, R.M., Buringh, E., ten Brink, H.M., Lutz, M., Bruckmann, P., Straehl, P., Schneider, J., 2004. Speciation and origin of PM10 and PM2.5 in selected European cities. Atmospheric Environment 38, 6547–6555.

Van Dingenen, R., Raes, F., Putaud, J-P., et al., 2004. A European aerosol phenomenology-I: physical characteristics of particulate matter at kerbside, urban, rural and background sites in Europe. Atmospheric Environment 38, 2561–2577.

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16. november 2009

Journalnr.
Skriv Journalnr.

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Høringssvar til Miljøstyrelsens luftkvalitetsplan

Københavns Kommune sender hermed et foreløbigt høringssvar til Miljøstyrelsens "Luftkvalitetsplan for partikelforurening i København og Frederiksberg - Renere luft i byerne". Høringsmaterialet blev fremsendt den 27. oktober 2009 med svarfrist sat til den 17. november 2009. Kommunen har valgt at sende planen til politisk behandling, og der skal således tages forbehold for eventuelle efterfølgende tilføjelser eller ændringer til svaret. Den politiske behandling af sagen forventes afsluttet tidligt i 2010.

Baggrund

Miljøstyrelsen har ansvaret for at sikre, at grænseværdierne for acceptabelt luftkvalitet bliver overholdt i de danske byer. Der har været problemer med at overholde grænseværdierne for større partikler (PM_{10}) siden 2005 samt grænseværdien plus tolerancemargenen for kvælstofdioxid (NO_2) siden 2002. Miljøstyrelsen ansøgte EU-kommissionen om at få lov til at få udsættelse for overholdelse af PM_{10} grænseværdierne frem til 2011, men fik afslag fordi styrelsen ikke havde udarbejdet en luftkvalitetsplan i tide og i øvrigt godtgjort, hvad der anses for rimeligt for at begrænse partikelforureningen. Miljøstyrelsen har nu udarbejdet en luftkvalitetsplan for partikler, som i 2010 vil blive fulgt op af en plan for indsatsen med at nedbringe NO_2 forureningen.

Luftkvalitetsplanen for partikler skitserer kort følgende initiativer:

1. Indgåede internationale aftaler/direktiver
2. Direktiver for hvor meget der må udledes af forskellige gasser og partikler fra EU landene (NEC-direktivet)
3. FN´s internationale søfartsorganisation (IMO´s) internationale aftale om begrænsning af skibsforurening
4. Miljøzoner der kan udvides til at omfatte flere byer samt ældre varebiler
5. Grønne taxier
6. Afgifter på dieselbiler uden filter
7. Bæredygtig transport
8. Kommunale indsatser for at reducere luftforureningen

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Generelle bemærkninger

Københavns Kommune arbejder for at København bliver en ren og sund storby med god luftkvalitet til gavn for byens borgere og brugere. Med Københavns nye klimaplan arbejder Kommunen også for at reducere CO_2 udledningen med 20 % fra 2005-2015 og at blive CO_2 neutral i 2025. Derfor går vi gerne i dialog og samarbejde om at forbedre miljøtilstanden, hvor trafikforureningen er én at de helt store udfordringer. Det er dog samtidig vigtigt, at samarbejdet er seriøst og helhedsorienteret med en reel miljøeffekt i sigte, både på den korte og lange bane.

Kommunen efterlyser derfor en samlet plan for både partiklerne og NO_2 for at sikre de mest optimale løsninger for begge miljøudfordringer, og for at undgå fejlinvesteringer der fx nedbringer partikelforureningen på bekostning af øget NO_2 forurening. En samlet luftkvalitetsplan understøttes desuden af EU Kommissionens luftdirektiv (artikel 22), der foreskriver, at EU landene udarbejder en samlet luftkvalitetsplan for alle problemstofferne, hvor det giver mening, hvilket er tilfældet her.

Luftdirektivet (artikel 23) foreskriver desuden, at der skal udarbejdes luftkvalitetsplaner, såfremt der sker en overskridelse af tolerancemargen plus grænseværdi, hvilket er tilfældet for NO_2 i København. I Miljøstyrelsens netop offentliggjorte rapport "Virkemidler til begrænsning af overskridelser af NO_2 grænseværdien for luftkvalitet i større byer" fremgår det, at der forventes at være en overskridelse af NO_2 grænseværdien i 35 københavnske gadestrækninger i 2010, 15 gadestrækninger i 2015 og 2 gadestrækninger i 2020. Af rapporten fremgår det endvidere, at det ikke er tilstrækkelig at anvende emissionsbegrænsende udstyr, men at der er behov for kombinationsløsninger i form af renere køretøjer og mindre trafik som følge af fx kørselsafgifter eller betalingsring.

Kommunen undrer sig derfor over, at Miljøstyrelsen har fravalgt at vurdere effekten på kørselsafgifter, der både har en effekt på NO_2 forureningen, men også på trafikkens direkte partikeludledning og ophvirvling af vejstøv. Det viser erfaringerne fra London og Stockholm, hvor man har indført betalingsring.

Miljøstyrelsens udkast til luftkvalitetsplan anser kommunen ikke for at være en egentlig plan, men et overslag over mulige initiativer til at nedbringe luftforureningen. En egentlig plan skal indeholde en beskrivelse af og dokumentation med beregningsforudsætninger for, hvor meget de forskellige initiativer kan reducere luftforureningen. Her er det ikke nok, bare at henvise til en referenceliste over en lang række forskellige rapporter. Miljøstyrelsen må klart melde ud, hvad der ligger til grund for deres vurderinger. Kommunen savner desuden en milepælsplan for implementering af initiativerne. Hvor lang tid tager det

fx at få lovgivningerne på plads samt den efterfølgende indfasningstid, inden der kan forventes fuld miljøgevinst? Endeligt savnes der en miljøeffektvurdering af initiativerne både på kortere og længere sigt fx anskueliggjort for år 2010, 2015 og 2020.

Københavns Kommune vurderer således ikke, at luftkvalitetsplan opfylder de minimums informationer, som luftdirektivet forskriver. Det gælder bl.a. om manglende eller ikke fyldestgørende beskrivelser af:

1. Teknikker, der er anvendt til vurderingen
2. Udførlige oplysninger om mulige foranstaltninger til forbedring af luftkvaliteten
3. Tidsplan for gennemførelse
4. Skøn over den planlagte forbedring af luftkvaliteten og af den tid, som skønnes at være nødvendigt for at nå kvalitetsmålsætningerne

De manglende informationer gør det samlet set vanskeligt for kommunen at vurdere, om de foreslåede miljøtiltag er tilstrækkelige og de rigtige.

Konkrete bemærkninger

Aftaler for internationalt skibstrafik: Den internationale søfartsorganisation (IMO) har vedtaget regler, som sigter mod at reducere skibstrafikkens forurening med svovldioxid (SO_2) og kvælstofoxider (NOx) i årene frem til 2020. Denne reduktion vil have en positiv afsmittende effekt på partiklerne, som i visse tilfælde er dannet ud fra forureningen med SO_2 og NOx. Det er således et langsigtet tiltag, hvor Kommunen savner dokumentation for, at tiltaget vil give den nødvendige reduktion for partiklerne allerede i 2011, som er sidste frist for overholdelse af grænseværdierne for PM_{10} partikler.

Udvidelse af miljøzonerne:

Afgifter på dieselbiler uden filter/oxidationskatalysator

Kommunen stiller sig tvivlende med hensyn til effekten af, at en årlig afgift på 1000 kr. skal få bilejerne til at eftermonterer en filter/oxidations-katalysator til ca. 8.000-10.000 kr. på deres dieseldrevne personbiler. Kommunen foreslår i stedet, at staten gør det økonomisk attraktivt at udskifte gamle dieselpersonbiler med nye biler udstyret med effektivt partikelfilter og NOx reducerende udstyr. De fabriksmonterede filtre er af væsentlig bedre kvalitet end de foreslåede eftermonterede filtre/oxidations-katalysatorer.

Bæredygtig transport og kommunale virkemidler

Kommunen deler regeringens opfattelse af, at det er vigtigt at sætte fokus på en grøn transportpolitik, hvor det er vigtigt at fremme den kollektive transport, forbedre forholdene for cyklister samt at have fokus på udvikling af miljøvenlige biler på fx el, brint samt hybride biler. Kommunen deler endvidere Miljøstyrelsens opfattelse af, at Kommunen råder over en række virkemidler, der kan være med til at forbedre miljøet og trafikfremkommelighed som fx trafiksanering, parkeringsrestriktioner, fremme af cykeltrafik, delebilsordninger, støjdæmpende asfalt, grønne krav ved udbud af den kollektive trafik. Det er tiltag som kommunen allerede gør i stor stil.

Derfor efterlyser Kommunen også en kvalificering af, hvad det er vi kan gøre ekstraordinært samt miljøgevinsten ved dette. Eksempelvis ses det i Miljøstyrelsens rapport fra efteråret 2009 om "Virkemidler til begrænsning af overskridelser af NO_2 grænseværdien for luftkvalitet i større byer", at yderlige kommunale tiltag ikke har nogen synlig effekt på miljøet.

Kommunen er dog altid interesseret i at indgå i relevant samarbejde om at begrænse trafikmængden og forbedre teknologiudviklingen på køretøjerne, hvor det har en reel miljøeffekt på den korte eller lange bane.

Venlig hilsen

Birte Busch Thomsen

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Høringssvar i forbindelse med høring af Luftkvalitetsplan for København og Frederiksberg

Miljøstyrelsen har d. 27-10-2009 udsendt forslag til Luftkvalitetsplan for København og Frederiksberg i offentlig høring. Danmarks Miljøundersøgelser ved Aarhus Universitet (DMU) finder, at der er mange gode elementer i luftkvalitetsplanen. Imidlertid er der også punkter, hvor planen ikke stemmer fuldt ud med DMU's faglige viden på området, hvilket er grundlag for dette høringssvar. I det følgende beskrives disse punkter, og i vedlagte bilag er grundlaget yderligere uddybet.

I henhold til EU's luftkvalitetsdirektiv (2008/50/EF) bygger luftkvalitetsplanen på, at det er tilladt at reducere PM_{10} med den andel af partikelmassen, som stammer fra naturligt forekommende havsalt samt salt fra saltning af veje om vinteren. Først når disse fradrag er trukket fra vurderes om grænseværdien er overskredet. På basis af rapport fra DMU (Wåhlin, P., Faglig rapport fra DMU, nr. 688, 2008) vurderes, at det årlige fradrag for havsalt svarer til 2,5 µg/m³ og udgøres hovedsageligt af NaCl (1,5 µg/m³) og $NaNO_3$ (1,0 µg/m³). Imidlertid fremgår det af udkast til "Guidance on the quantification of the contribution of natural sources under the EU Air Quality Directive 2008/50/EC" (EU Kommisionen, juli 2009) at $NaNO_3$ regnes som menneskeskabt, fordi NO_3 kommer fra udledning af NO_x. I henhold til udkastet til vejledning om fratrækning af bidrag fra naturlige kilder er fradraget fra havsalt, derfor kun 1,5 µg/m³ svarende til andelen af NaCl. Dette har betydning for reduktionsbehovet, som Miljøstyrelsen vurderer til at være ca. 5 µg/m³, men hvis ovenstående ikke kan trækkes fra er reduktionsbehovet ca. 6 µg/m³.

I luftkvalitetsplanen angives i tabel 4 den af Miljøstyrelsen forventede effekt af allerede besluttede tiltag til reduktion af PM_{10} i København og Frederiksberg.

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På basis af DMU's faglige viden vurderes, at effekten er overvurderet for en række af de besluttede tiltag. Dette drejer sig om følgende tiltag:

Partikler (PM_{10}) - årsmiddelværdi	Effekt af allerede besluttede tiltag for København ($\mu g/m^3$)	
	Luftkvalitetsplanen	DMU's vurdering
Grønne taxier	1,0	0,3
IMO aftale om skibsfart	0,3	0,2
Miljøzoner med krav til varebiler		

Vi er principielt enige i den anvendte fremgangsmåde i luftkvalitetsplanen, men vil pointere, at der er stor usikkerhed på mange af delresultaterne nævnt i luftkvalitetsplanen.

Med venlig hilsen

Lars Moseholm
Forskningschef

Modtager:
Miljøstyrelsen
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NOTAT

Udarbejdet af: Steen Solvang Jensen, Thomas Ellermann, Matthias Ketzel, Helge Rørdam Olesen, og Peter Wåhlin

DMU's vurdering af effekten af Miljøstyrelsens luftkvalitetsplan for reduktion af partikelforureningen

Dato: 16. november 2009
Sagsnr.: DMU-15-00045
Ref: SSJ

1. Baggrund og formål

Miljøstyrelsen har den 26. oktober 2009 sendt en ny luftkvalitetsplan for partikelforurening i høring med høringsfrist den 17. november 2009. Målet med planen er at Danmark kan overholde grænseværdierne for luftkvaliteten af PM_{10}.

Luftkvalitetsplanen bygger i høj grad på rapporter og notater, som DMU har udarbejdet, idet 7 ud af 8 referencer i planen er fra DMU.

DMU har vurderet grundlaget for planen samt vurderet effekten af de enkelte tiltag i planen, hvor DMU enten har bidraget direkte til eller indirekte til vurdering af tiltagenes effekt. For nogle tiltag har DMU i tidligere rapporter beregnet effekten, mens Miljøstyrelsen for andre tiltag har vurderet effekten på baggrund af analyse og viderefortolkning af DMU rapporter og notater. Dette notat opsummerer DMU's vurdering af effekten af de enkelte tiltag ud fra det faglige grundlag, som DMU har leveret i form af baggrundsrapporter og notater.

Miljøstyrelsens luftkvalitetsplan tager udgangspunkt i H.C. Andersens Boulevard (HCAB) i København, hvor der er problemer med overskridelse af grænseværdien for PM_{10} (både som årsmiddelværdi men især for den 35. højeste døgnværdi). Udgangspunktet er, at hvis luftkvalitetsplanen løser problemerne her vil de være løst alle steder, da koncentrationerne er de højeste målte på dette sted.

Årsmiddelværdien for PM_{10} på HCAB er omkring 42,5 µg/m³. EU luftkvalitetsdirektivet giver mulighed for at fratrække korrektion for målemetode samt vejsalt og havsalt, hvilket Miljøstyrelsen vurderer til i alt 5,6 µg/m³ ud fra en kildeopgørelse, som DMU har foretaget. Det korrigerede niveau er derfor 36,9 µg/m³. DMU har vist en sammenhæng mellem årsmiddelværdi og antallet af overskridelser af døgnmiddelværdien. For at reducere antallet af overskridelser af døgnmiddelværdien til 35 dage på et år, vurderes det, at årsmiddelværdien skal reduceres til 32 µg/m³. Miljøstyrelsens plan går derfor ud på at reducere fra 36,9 µg/m³ til 32,1 µg/m³ gennem en række tiltag.

Miljøstyrelsens vurdering af effekten af de enkelte tiltag er opsummeret i nedenstående tabel, som er fra luftkvalitetsplanen.

Tabel 1. Oversigt over effekt af forskellige tiltag i luftkvalitetsplanen

Partikler (PM_{10}) – årsmiddelværdi	København (HCAB)
Forventet niveau 2011 uden tiltag	36,9
Effekt af allerede besluttede tiltag:	
- Omlægning af kørselsafgifter	0
- Grønne taxier	1,0
- Afgifter på dieselbiler uden filter	0,3
- IMO aftale om skibsfart	0,3
- NEC direktiv om generelle reduktioner af luftforurening	1,0
Forventet niveau 2011 (med besluttede tiltag)	32,1

2. DMU vurdering af den overordnede metode

DMU er grundliggende enig i den overordnede metode, som er lagt til grund for luftkvalitetsplanen.

Der knytter sig dog nogle usikkerheder til delelementer af planen, som er gennemgået nedenfor.

2.1 Fradrag af havsalt

I udkast til luftkvalitetsplanen er der regnet med en reduktion på 2,5 µg/m³ af PM_{10} ved at fratrække bidrag fra havsalt. De 2,5 µg/m³ er fremkommet ved receptormodellering og svarer til summen af årsmiddelværdierne for NaCl (1,5 µg/m³) og $NaNO_3$ (1,5 µg/m³; dannes udfra NaCl ved reaktion med HNO_3).

I udkast til "Guidance on the quantification of the contribution of natural sources under the EU Air Quality Directive 2008/50/EC" er det specificeret, at $NaNO_3$ regnes som menneskeskabt, fordi nitrat kommer fra udledninger af NOx. Årsmiddelværdien af $NaNO_3$ er estimeret til omkring 1,0 µg/m³. *Med mindre udkast til vejledningen er ændret på dette punkt, er havsaltsbidraget kun på 1,5 µg/m³ og dermed vurderet 1 µg/m³ for højt i luftkvalitetsplanen.*

2.2 Usikkerhed på trafikkens PM udstødningsbidrag

I kildeopgørelsen for HCAB er udstødningsbidrag for PM_{10} vurderet af DMU til 5,7 µg/m³ ud fra receptormodellering. Usikkerheden på dette bidrag ud fra metoden i receptormodellering vurderes at være omkring ± 1,5 µg/m³.

Beregning af gadebidraget for udstødning vha. af DMU's spredningsmodel OSPM og EU's COPERT-IV emissionsmodel giver 3,4 µg/m³ i 2007 og 3,1 µg/m³ i 2008. Hertil skal lægges udstødningsbidraget fra hele byens trafik for at få udstødningsbidraget til bybaggrundskoncentrationen. I Partikelprojektet (Miljøprojekt Nr. 1021, 2005) blev dette bybaggrundsbidrag beregnet til 1,7 µg/m³ for PM_{10} i 2003, hvor udstødningsdelen udgør omkring 26% dvs. ud-

stødningsbidrag for bybaggrund er omkring 0,44 µg/m³. PM_{10} udstødning for HCAB ud fra spredningsmodeller giver derfor omkring 3,5-4,0 µg/m³. Dette er noget lavere end, hvad receptormodelleringen viste.

I Miljøstyrelsens tiltag forventes en reduktion i udstødningen på 3,5 µg/m³, som tager udgangspunkt i at bidraget fra trafikken er 5,7 µg/m³. *Hvis udstødningsbidraget er lavere (3,5-4,0 µg/m³), som spredningsmodellen viste, vil effekten af de forskellige tiltag tilsvarende være lavere, og derfor overvurderet.*

3. DMU vurdering af de enkelte tiltag

DMU har kun vurderet de tiltag, hvor DMU er nævnt som kilde.

3.2 Grønne taxier

Miljøstyrelsen vurderer at grønne taxier vil reducere PM_{10} koncentrationen med 1,0 µg/m³.

Her baserer MST sin vurdering af effekten på et DMU notat (Taxiers bidrag til luftforurening af NO_x og partikler i København). Dette notat beskriver alene emissionen, og der er ikke i notatet vurderet, hvad det betyder for luftkvaliteten.

Ud fra emissionsfaktorer og køretøjsfordelingen (se tabel 2) kan taxiers bidrag til PM udstødningen beregnes til 5,8%. Hvis trafikkens bidrag til PM_{10} koncentrationen er 5,7 µg/m³ andrager taxier således 0,33 µg/m³. Hvis man som Færdselsstyrelsen antager, at et lukket partikelfilter reducerer partikeludstødningen med 80%, kan taxiers partikeludstødning reduceres med 0,26 µg/m³.

DMU mener derfor, at Miljøstyrelsen overvurderer effekten af grønne taxier med omkring 0,74 µg/m³.

Tabel 2 Fordeling af PM udstødning på køretøjsgrupper

H.C. Andersens Boulevard 2010, ugedage (Daycase 1), BasisScenario med Miljøzone

	Pesonbiler	Taxi	Varebiler	Lille lastbil	Stor lastbil	Bus	I alt
PM10NonExh (g/km)	0.046	0.066	0.066	0.230	0.258	0.230	0.057
PM2.5NonExh (g/km)	0.014	0.019	0.019	0.062	0.081	0.062	0.017
PMExh (g/km)	0.015	0.013	0.056	0.032	0.051	0.061	0.020
PMExh (g/km) vægtet	0.012	0.001	0.006	0.001	0.000	0.001	0.020
PMExh (g/km) vægtet (%)	57.9	5.8	28.3	3.4	0.9	3.7	100.0
Trafikfordeling (%)	77.3%	8.9%	10.1%	2.1%	0.4%	1.2%	100.0%

3.3 Miljøzoner med krav til varebiler

3.4 IMO aftale om skibsfart

I luftkvalitetsplanen vurderes, at IMO-aftalen om skibsfart vil reducere PM_{10} med 0,3 µg/m³.

I DMU's rapport fremgår dette tal ikke direkte, men DMU vurderer, at der er i baggrundsmaterialet findes belæg for en reduktion på 0,2 µg/m³. Dette er 0,1 µg/m³ mindre end angivet i luftkvalitetsplanen.

3.5 NEC direktiv om generelle reduktioner af luftforurening

I luftkvalitetsplanen angives, at den generelle indsats overfor luftforureningen i Europa forventes at give et årligt fald på ca. 0,2 µg/m³ på basis af resultater fra DMU-rapport fra 2006. Luftkvalitetsplanen angiver, at for perioden 2005-2007 og *frem til 2011 forventes den løbende indsats i Europa, derfor at give en reduktion på 1,0 µg/m³*. Denne forventning er formentlig fortsat rimelig baseret på reguleringerne af emissionerne i Europa frem til 2010. Der skal

dog gøres opmærksom på, at der fortsat ikke er fastlagt yderligere stramninger af udledningerne efter 2010.

Referencer

Miljøstyrelsen (2009): Luftkvalitetsplan for partikelforurening i København og Frederiksberg - Renere luft i byerne. Udkast af 26.10.2009.

Miljøstyrelsen (2009): UDKAST af 13. oktober 2009 om Lovforslag om ændring af miljøbeskyttelseslovens regler om miljøzoner (§ 15 a – e) m.v.

17.11.2009

Høringssvar

Miljøstyrelsen har d. 27. oktober 2009 udsendt et høringsudkast til en "Luftkvalitetsplan for partikelforureningen i København og Frederiksberg – Renere luft i byerne". Applus+ Bilsyn er godt tilfreds med, at regeringen vil forbedre luftkvaliteten i de danske byer. Det ligger i tråd med vores arbejde med at miljøsikre biler via forureningsmålinger ved syn. Applus+ Bilsyn giver nedenfor sine forslag til forbedring af luftkvalitetsplanen.

Forslag 1: Indfør tyske miljøzoner

Det undrer Applus+ Bilsyn, at personbiler slet ikke er omfattet af luftkvalitetsplanen. I Berlin findes (som bekendt) miljøzoner med krav til alle køretøjskategorier og et alderskrav. Fra årsskiftet skal alle dieselbiler i Berlin således opfylde EURO 4 normen eller EURO 3 med partikelfilter. Ligeledes skal alle benzinbiler have en katalysator (se tabel).

		Miljøzonen i Berlin	
		Solgt efter	Alders og rensekrav
Tunge køretøjer	Diesel	1. okt. 2006	2001 med partikelfilter
Varebiler	Diesel	1. jan. 2006	2001 med partikelfilter
	Benzin	1. jan 1993	1993 med katalysator
Personbiler	Diesel	1. jan. 2006	2000 med partikelfilter
	Benzin	1. jan 1993	1993 med katalysator

Derfor foreslår Applus+ Bilsyn, at der indføres en miljøzone med samme ambitiøse miljøkrav som i Berlin. Dels for at forbedre luftkvaliteten; dels for at undgå importen af gamle tyske biler.

Forslag 2: Indfør katalysatorkrav til benzinbiler

Såfremt det ikke er muligt, at indføre miljøzoner efter Berlinermodellen som beskrevet ovenfor, så bør som minimum sikres, at benzindrevne person- og varebiler får påmonteret en katalysator.

I Danmark er ca. 12,5 % af bilerne (250.000 biler) fra før katalysatorkravet blev indført i 1991. I de største danske byer er 7,5-10 % af benzinbilerne uden katalysator. Det svarer til ca. 30.000 biler i København. Benzinbiler uden katalysator forurener 7-8 gange så meget med sundhedsskadelige gasser som nyere benzinbiler med katalysator. Samtidig har gamle benzinbiler 20 % større CO2-udledning og ca. 7 gange flere alvorlige sikkerhedsfejl på bremser og styretøj sammenholdt med nyere benzinbiler.

Derfor foreslår Applus+ Bilsyn, at der som minimum indføres katalysatorkrav til benzinbiler uden katalysatorer i miljøzonerne. Alternativt kan skrotning fremmes via afgifter eller tilskud.

I er velkomne til at kontakte undertegnede, såfremt I ønsker en uddybning.

De bedste hilsner

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FREDERIKSBERG
KOMMUNE

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Vedr. Udkast til luftkvalitetsplan om partikler i København og Frederiksberg. Lov om ændring af lov om miljøbeskyttelsesloven, der vedrører miljøzoner m.v.

Frederiksberg Kommune har modtaget ovennævnte forslag i høring. Kommunen har følgende bemærkninger:

Frederiksberg Kommune er generelt positiv overfor forslagene, som samlet vil medvirke til at styrke indsatsen overfor især partikelforurening, som er den mest problematiske luftforureningsparameter i tæt befolkede byområder som Frederiksberg.

23. november 2009
Sagsbeh: nkj/re
Sagsnr.:1147-61166
Dokument: 1147-831488

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[redacted]. Frederiksberg Kommune kan i den sammenhæng anføre, at kommunen i 2010 forventer at udarbejde en lokal strategi for reduktion af luftforureningen, også indeholdende overvejelser om NO2. Kommunen skal derfor foreslå, at man i forbindelse med den statslige strategi overvejer koblingen mellem lokale og nationale handlemuligheder, for at sikre den bedst mulige effekt. Kommunen indgår gerne i en drøftelse med styrelsen omkring lokal strategi/national strategi optimering.

Niels Kaalund
Civilingeniør

Kopi:
Kommunernes Landsforening
Københavns Kommune
Århus Kommune
Odense Kommune
Aalborg Kommune

DET ØKOLOGISKE RÅD
FREMTIDENS MILJØ SKABES I DAG

17.11.09

Høringssvar

Miljøstyrelsen har d. 27/10 2009 udsendt udkast til en *Luftkvalitetsplan for partikelforureningen i København og Frederiksberg* i høring. Nedenfor findes Det Økologiske Råds høringssvar.

For det første finder Det Økologiske Råd det dybt utilfredsstillende, at luftkvalitetsplanen har et snævert fokus på opfyldelse af EU's grænseværdi for PM10 - i stedet for at have fokus på at nedbringe forureningen med de stærkt sundhedsskadelige ultrafine partikler (PM0,1). Det er befolkningens sundhed, der skal være i fokus og ikke kun opfyldelsen af EU's grænseværdier.

Tabel 4 angiver reduktionen som følge af forskellige tiltag. Flere tiltag overvurderes markant.

a) **"Grønne Taxier" overvurderes med 40 %.** Miljøstyrelsen har tidligere i år informeret EU-Kommissionen (J.nr. MST-525-00028) om, at initiativet vil give en reduktion på 0,7 $\mu g/m^3$. Nu giver tiltaget pludselig 1 $\mu g/m^3$. Det er en overvurdering på ca. 40 %. Begrundelse savnes.
b) **Afgifter på dieselbiler uden filter overvurderes med 200 %.** Miljøstyrelsen forventer, at initiativet vil give en reduktion på 0,3 $\mu g/m^3$, da over 80 % persondieselbiler vil montere filteret. Dette er usandsynligt. I praksis vil næppe mere end 20 % montere filter (jf. de sidste måneders debat, bl.a. udtalelser fra FDM og Venstres skatteordfører). Reduktionen bliver derfor næppe mere end max. 0,1 $\mu g/m^3$ dvs. en overvurdering af dette tiltag på ca. 200 %.
c) **NEC direktivet overvurderes**. Det forudsættes nemlig alt andet lige, at de andre EU-lande opfylder direktivet, hvilket næppe er tilfældet. Dette vil give en overvurdering.

Det anses for usandsynlig, at Danmark opfylder PM10-grænseværdien uden yderligere tiltag.

Endelig anser Det Økologiske Råd det for positivt, at der omsider åbnes op for kørselsafgifter og derved omkostningseffektive trafikreduktioner, der ud over at reducere forureningen også giver et provenu, som kommunerne skal have lov til at anvende på at forbedre alternativerne til biltrafikken.

Mvh. Kåre Press-Kristensen, Civilingeniør, Ph.D.
Det Økologiske Råd, Blegdamsvej 4B, 2200 Kbh. N

MILJØPUNKT AGENDA 21 · FOR ET BÆREDYGTIGT KBH | NØRREBRO

DET ØKOLOGISKE RÅD
FREMTIDENS MILJØ SKABES I DAG

Danmarks Naturfredningsforening

17.11.09

Høringssvar

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Mvh. Kåre Press-Kristensen, Civilingeniør, Ph.D, Blegdamsveh 4B, 2200 Kbh. N
På vegne af Det Økologiske Råd, Danmarks Naturfredningsforening, Miljøpunkt Nørrebro og Rådet for Bæredygtig Trafik