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Assessment of non-exhaust PM emissions by road traffic in urban areas (an Air4EU case study)

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6th Framework Programme- Policy oriented Research
Priority 8.1 Topic 1.5 Task 2



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dations

- AQ PM₁₀ exceeds in inner-urban roads
- Traffic-related PM important health concern;
- AQ PM assessment by monitoring (urban background) + street-canyon modelling.
- EF traffic: exhaust PM (COPERT) but *non-exhaust PM: mixture of (mainly) re-suspension of road dust, friction and tire-wear?*

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This case study demonstrates a recommended method:

to estimate non-exhaust emissions of PM by road traffic in urban areas

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- *Collect* hourly monitoring data (NO_x , $\text{PM}_{10/2.5}$) at urban background station and street station;
- *Compute* hourly increment $\text{PM}_{10/2.5}$ and NO_x at street station;
- *Compute* hourly increment ratios $\text{PM}_{10/2.5}/\text{NO}_x$;
- *Estimate* exhaust emission ratios $\text{PM}_{10/2.5}/\text{NO}_x$ from traffic data in the street;
- Differences between *monitored* and *emitted* ratios $\text{PM}_{10/2.5}/\text{NO}_x$: indication for contribution non-exhaust PM.

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Rome



Oslo



Rotterdam

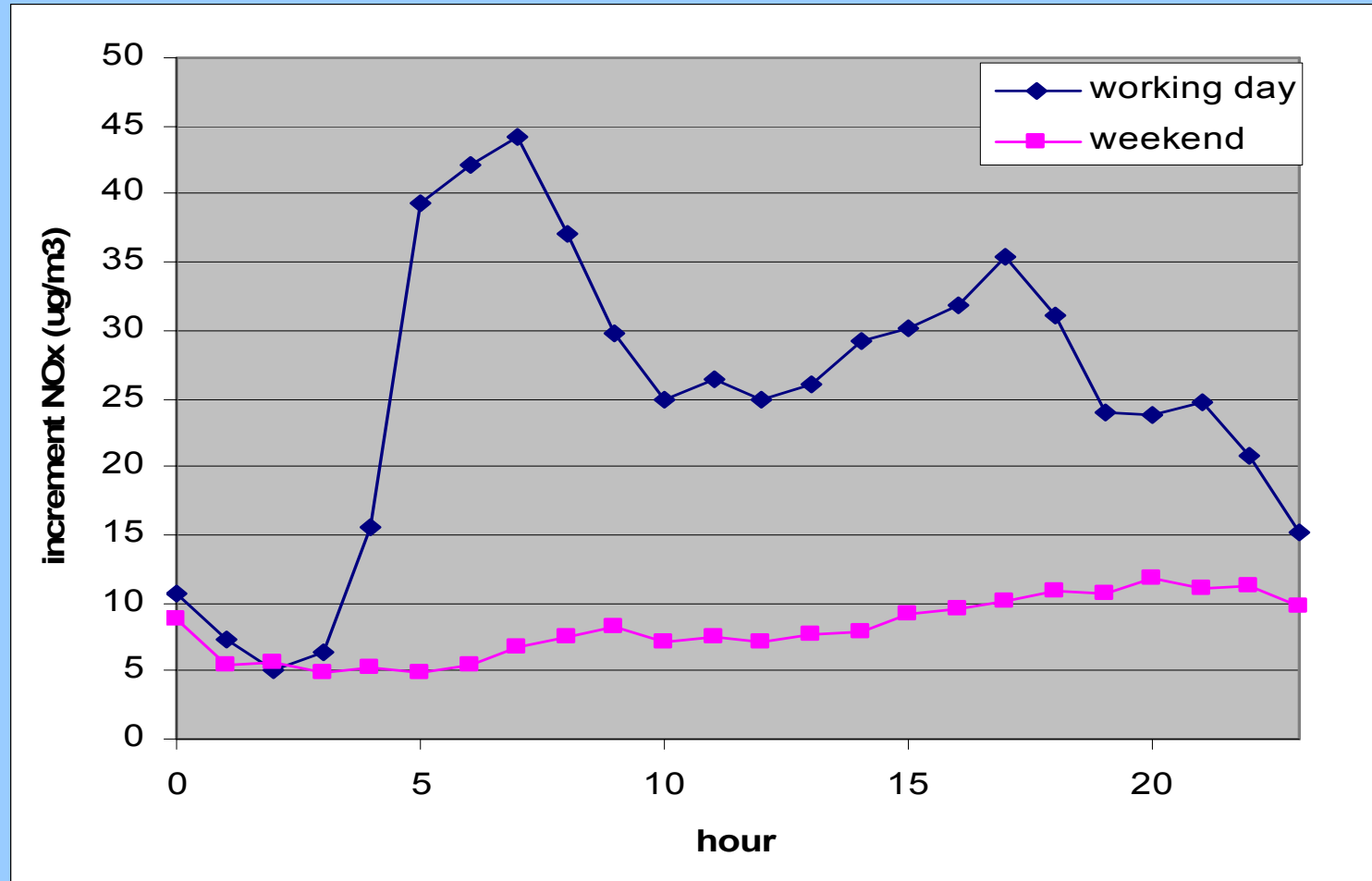


London



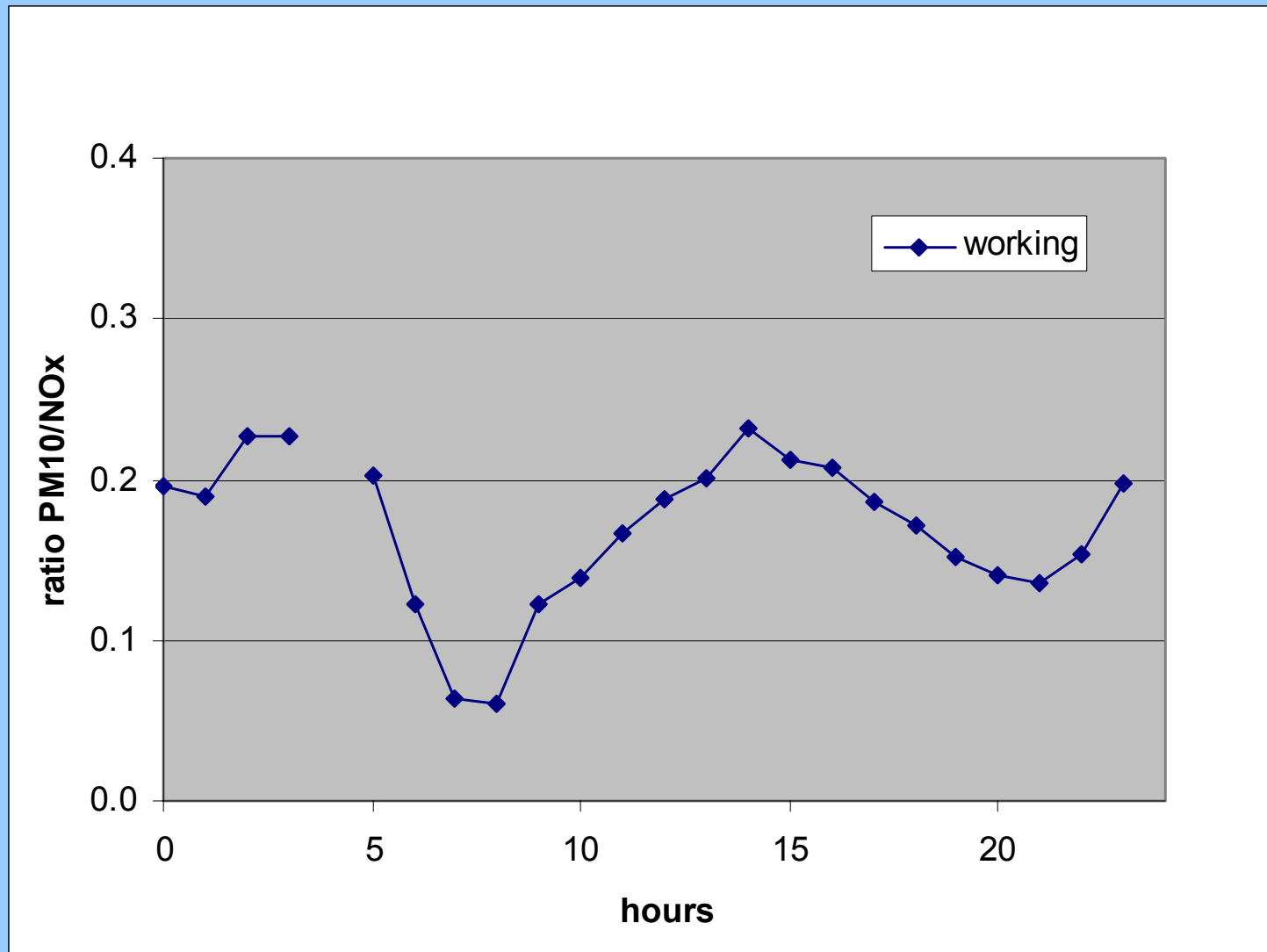
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Rotterdam: Increments measured NO_x



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Rome: Ratio increment measured PM_{10}/NO_x



London: Ratio increment measured PM_{10}/NO_x and $PM_{2.5}/NO_x$ (working days and weekend)

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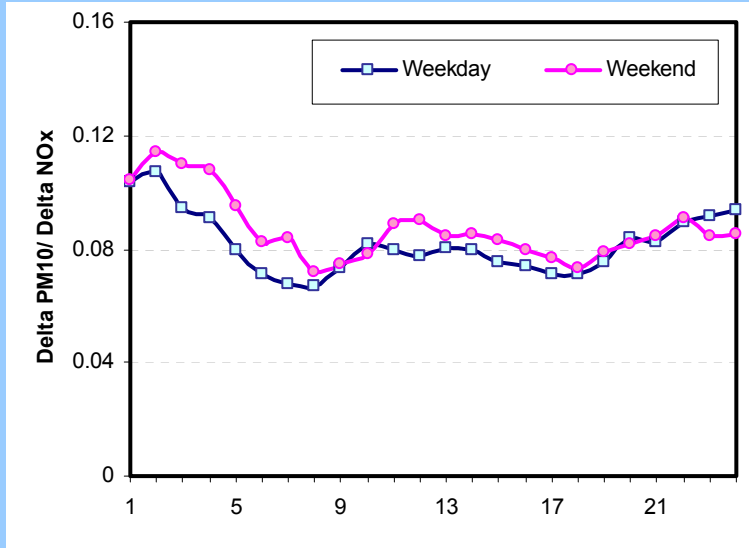
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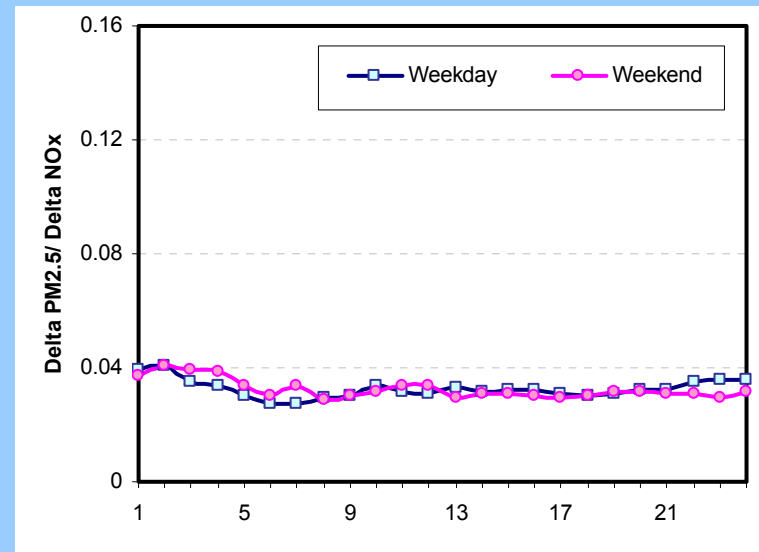
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PM_{10}/NO_x



$PM_{2.5}/NO_x$

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Ratio of measured increments and exhaust emissions (working days)

	measured increments ratio PM₁₀/NO_x	measured increment ratio PM_{2.5}/NO_x	exhaust emission ratio PM/NO_x
Rome	0.17	-	0.05
Rotterdam	0.12	-	0.05
London	0.08	0.03	0.05
Oslo (highway; winter)	0.30	0.04	0.027

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Findings case study: non-exhaust

- similar as exhaust (London/R'dam);
- 1.5 * higher as exhaust Rome;
(meteo? two-wheelers? fraction heavy duty?)
- 2* higher as exhaust Oslo (studded tyres);

International EF non-congested urban traffic

1.) *Exhaust*

- Light duty: 50 – 75 mg/km;
- Heavy duty: 200 – 300 mg/km;

2.) *Non-exhaust: friction + tyre wear*

- Light duty: 10 mg/km;
- Heavy duty: 40-70 mg/km;

3.) *Non-exhaust: mainly re-suspension*

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- A simple method is demonstrated based upon monitoring and traffic data to estimate *non-exhaust* PM₁₀ traffic emissions;
- Non-exhaust emissions mainly consist of PM_{2.5-10} and is mainly resuspension and less friction/tyre wear;
- Non-exhaust is in the same order as exhaust in West-Europe, and higher in South- (meteo? 2-wheelers? fleet composition?) and North-Europe (studded tyres in early spring);
- It is recommended:
 1. reproducibility of monitoring equipment;
 2. representativeness of urban background station;
 3. research on factors effecting non-exhaust: road type; # vehicles; fleet composition; speed and meteorology.