EU- Air Quality Directive and the Implementation in Cities
欧盟-空气质量指令及其在各城市的实施

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EU Legal Basis Air Quality
欧盟空气质量相关法律依据

The International Air Quality Policy Framework

国际空气质量政策框架（以下都为法律文件）

- The UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP) and its Protocols
- The knowledge base (EMEP, WGE, …)
- …

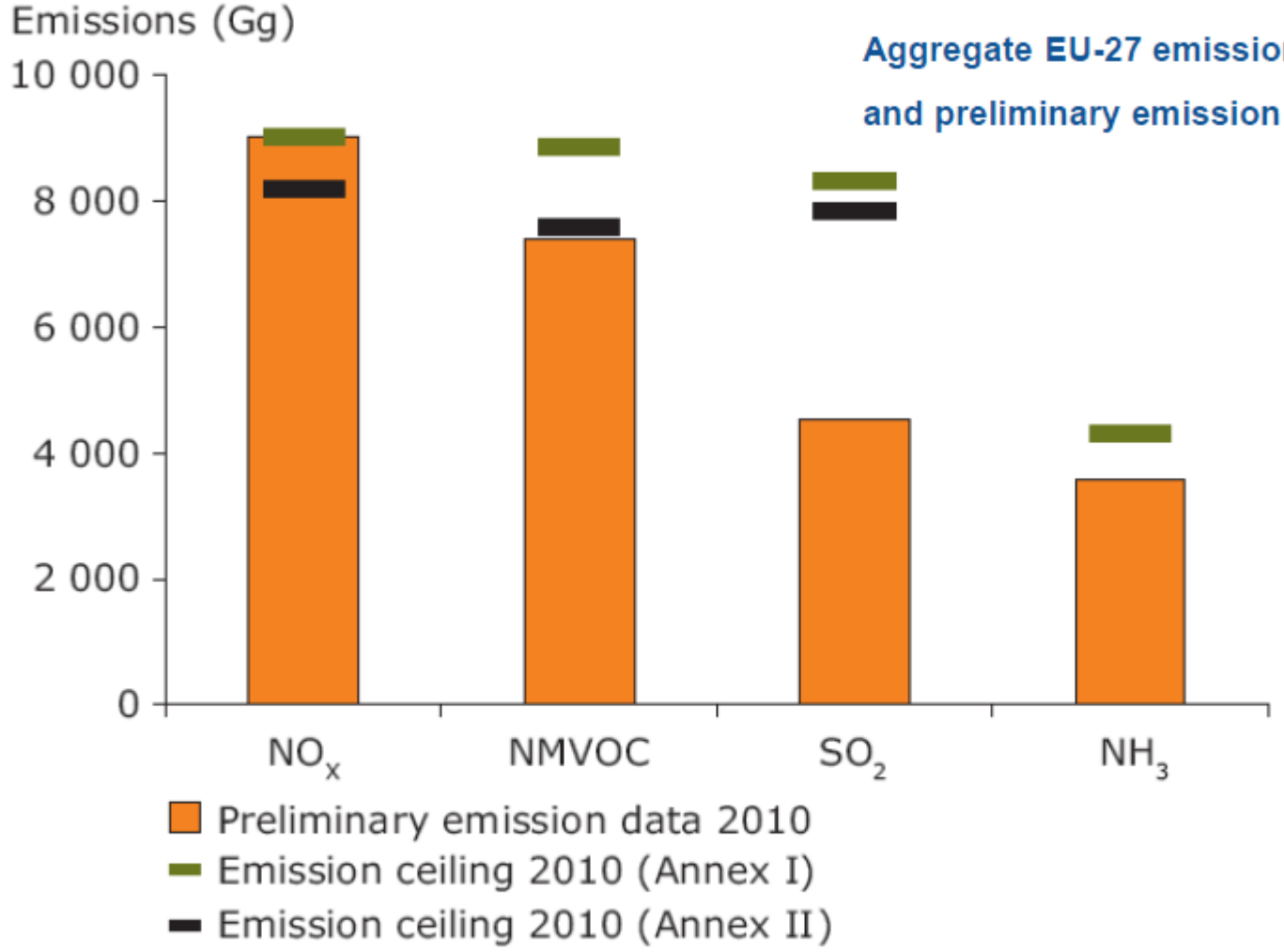
The EU Air Quality Policy Framework

欧盟空气质量政策框架（以下都为法律文件）

- The 2005 Thematic Strategy on Air Pollution
- The National Emission Ceilings Directive
- The Ambient Air Quality Directives
- The EU Air Pollution Source Abatement Policy Framework
- National and Local Air Pollution Abatement Measures
- …

National Emission Ceilings Directive

国家层面排放上限指令



Aggregate EU-27 emissions ceilings and preliminary emission data for 2010

The emission ceilings shown are the aggregated EU-27 emission ceilings defined in Annex I and Annex II of the NECD. Annex II of the NECD does not define a ceiling for NH3. Projections are aggregates of the projections reported by individual Member States.

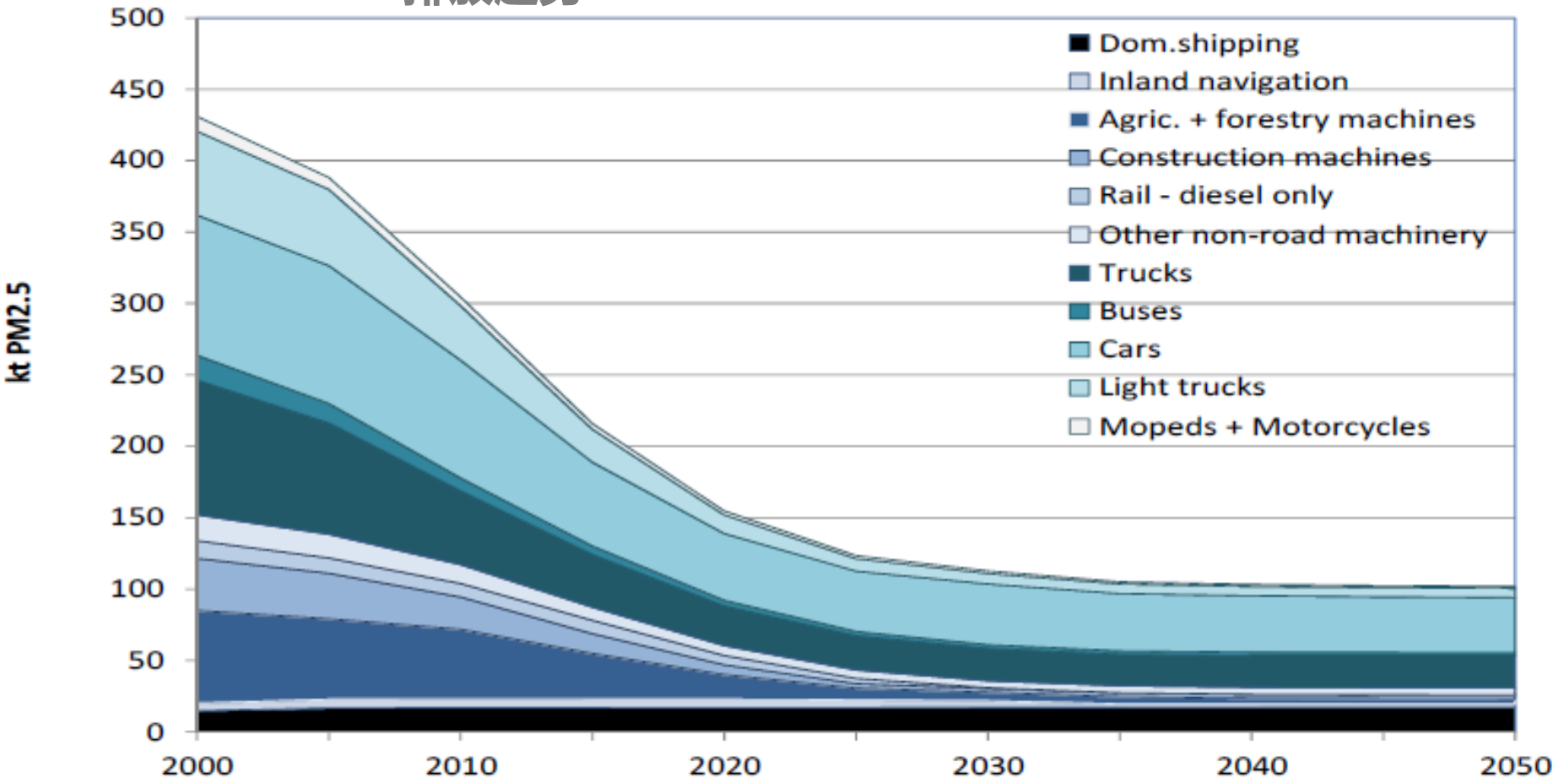
European Commission

EU Air Quality Directive 2008/50/EC
欧盟空气质量指令 2008/50/EC

Pollutant 污染物	*Concentra-tion 浓度*	*Averaging period 平均周期*	*Legal nature 法律性质*	*Permitted exceedences each year 每年允许超标*
Fine particles (PM2.5) 细颗粒物	25 µg/m3***	1 year 1年	Target value entered into force 1.1.2010 2010年1月1日为目标价值生效日 Limit value enters into force 1.1.2015 2015年1月1日为最迟价值生效日	n/a
Nitrogen dioxide (NO2)二氧化氮	200 µg/m3	1 hour 1个小时	Limit value entered into force 1.1.2010 2010年1月1日为最迟价值生效日	18
	40 µg/m3	1 year 1年	Limit value entered into force 1.1.2010* 2010年1月1日为最迟价值生效日	n/a
PM10 可吸入颗粒物	50 µg/m3	24 hours 24小时	Limit value entered into force 1.1.2005** 2005年1月1日为最迟价值生效日	35
	40 µg/m3	1 year 1年	Limit value entered into force 1.1.2005** 2005年1月1日为最迟价值生效日	n/a

Trends in Emissions

排放趋势



IIASA 2012 (Draft): Development of PM2.5 emissions from mobile sources in EU27
Note: Some NRMM categories do not follow trends and grow in importance (shipping, rail, ….)

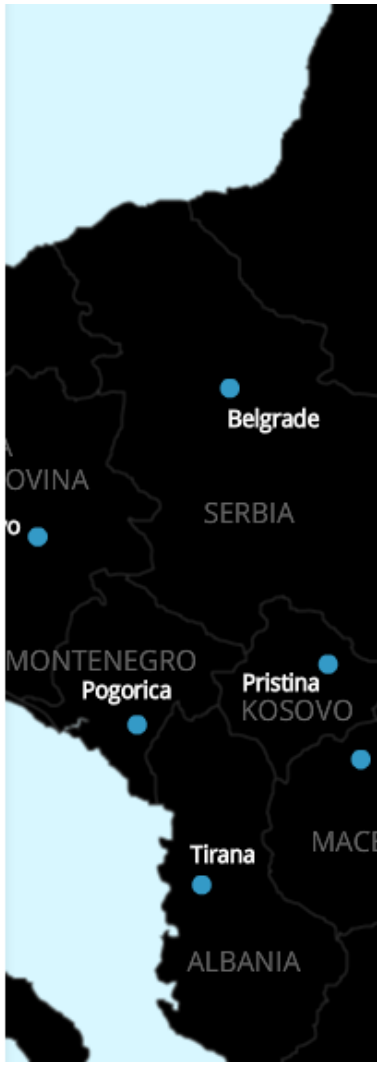
European Commission

European City Ranking
欧洲城市排名

Source | www.sootfreecities.eu

European City Ranking
欧洲城市排名

OVERALL RANK	OVERALL MARK	MEASURE GRAPH	CITY		
01	B 84%		Berlin 柏林 Capital of Germany	Berlin is the capital of Germany and with 3.4 million citizens also Germany's largest city. It is located in the eastern part of Germany, 70km west of the Polish border.	More Information ›
02	B- 82%		Copenhagen Capital of Denmark 哥本哈根	Copenhagen is the capital and largest city of Denmark and with an city population of almost 550,000 and a metropolitan population of close to 2 million people it is also Denmarks ...	More Information ›
	B- 82%		Stockholm Capital of Sweden 斯德哥尔摩	Stockholm is the capital and the largest city of Sweden and constitutes the most populated urban area in Scandinavia with a population of 851,155 in the municipality (2010) ...	More Information ›
03	B- 80%		Vienna 维也纳 Capital of Austria	Vienna is the Capital of Austria and with 1.7 million inhabitants also the largest city. It hosts offices of many international organisations, in particular of the United Nations (UNO).	More Information ›
	B- 80%		Zurich 苏黎世 Switzerland	With a population of 385,000 in the city and 1.1 million people in the surrounding area, Zurich is the largest city in Switzerland. It is situated in the north of Switzerland, near to the German ...	More Information ›
04	C- 71%		Amsterdam Capital of the Netherlands	Amsterdam is the largest city of the Netherlands with 783,000 inhabitants and a metropolitan population of almost 2.2 million people. The city is the official, cultural and financial ...	More Information ›
05	D+ 67%		Lyon France	Lyon is the 3rd largest city in France (population: 475,000) and is situated in the east, close to the Swizz border. The metropolitan area has a population of 1.3 million people.	More Information ›
06	D 64%		Glasgow United Kingdom	Glasgow is the largest city in Scotland and the third largest in the UK. The city has a population of almost 600,000, the greater Glasgow region almost 1.2 million and the whole region around the city around 2.4 million people.	More Information ›



Source信息来源 | www.sootfreecities.eu

European City Ranking
欧洲城市排名

			city around 2.4 million people.	More Information ›
	D 64%		Graz Austria	Graz is the capital of the state of Steiermark and with almost a population of almost 300,000 the second largest city of Austria. It is located in the south east of the country. More Information ›
07	D 62%		Paris 巴黎 Capital of France	Paris is the capital of France and also its largest city. It is mentioned on a series of top ten lists. With a population of almost 12 million inhabitants in the larger ... More Information ›
08	F 58%		Brussels Capital of Belgium	Brussels is the capital of Belgium and as a metropolitan region it has a population of 1.8 million. Brussels is a centre for international politics, among others hosting the headquarters ... More Information ›
	F 58%		London 伦敦 Capital of United Kingdom	London is the capital of the United Kingdom and the second largest city in the EU with 8.3 million inhabitants. The metropolitan area has a population of 12 to 14 million. More Information ›
	F 58%		Madrid Capital of Spain	Madrid is the capital of Spain and with a population of 3.4 million in the city and 6.3 in the metropolitan area it is the largest city in Spain and ranks as third largest in Europe. More Information ›
	F 58%		Stuttgart Germany	Stuttgart is the capital of the German state Baden-Wuerttemberg and Germanys 6th largest city. The city itself has a population of only 600,000, but the metropolitan area ... More Information ›
09	F 51%		Duesseldorf Germany	Duesseldorf is situated in Western Germany in the Rhine-Ruhr metropolitan region and is the Capital of the German state North Rhine-Westphalia. More Information ›
10	F 44%		Milan Italy	Milan is a city in the north of Italy and the capital of the region of Lombary. The cities population is about 1.3 million, while the greater metropolitan region around Milan has 7.4 ... More Information ›
11	F 38%		Rome Capital of Italy	Rome is located in the central-western part of Italy and is the countries capital and most-populated city with over 2.7 million inhabitants. Tourism is very important for the city and it is the ... More Information ›

Source来源 | www.sootfreecities.eu

伦敦再登欧洲首都城市中二氧化氮排放之首城市

Highest NO2 of any capital city in Europe again

Posted on June 1, 2013 by Simon Birkett

Download PDF

Boris Johnson must act in 'Green Week' in the 'Year of Air' after failing miserably to reduce air pollution

London again has the highest levels of nitrogen dioxide (NO_2), a toxic gas, of any capital city in Europe according to the latest data published by the European Environment Agency (EEA)

Marylebone Road monitoring station ranked the third worst of 2,836 monitoring stations across the whole of Europe for NO_2, falling from fourth worst in 2010. Government has stopped reporting results from Camden and Glasgow, previously in the 'Top 20' worst in Europe

London plummeted 346 places in the rankings for dangerous airborne particles (PM_{10}) as the Marylebone Road monitoring station showed no improvement between 2010 and 2011 as other cities successfully reduced air pollution

Source cleanairinlondon.org

Environmental Zones
环保区

Key points for a Label Ordinance

according to § 40 Abs. 3 BImSchG (2)

一个标签条例的关键点 - 根据联邦排放保护法 (2)第3款40条规定

P- Cars 小客车

- **Red Group 红色标签组**

PM > **50 mg/km** (Emission limits Euro 2)（欧2 排放限值）

- **Yellow Group 黄色标签组**

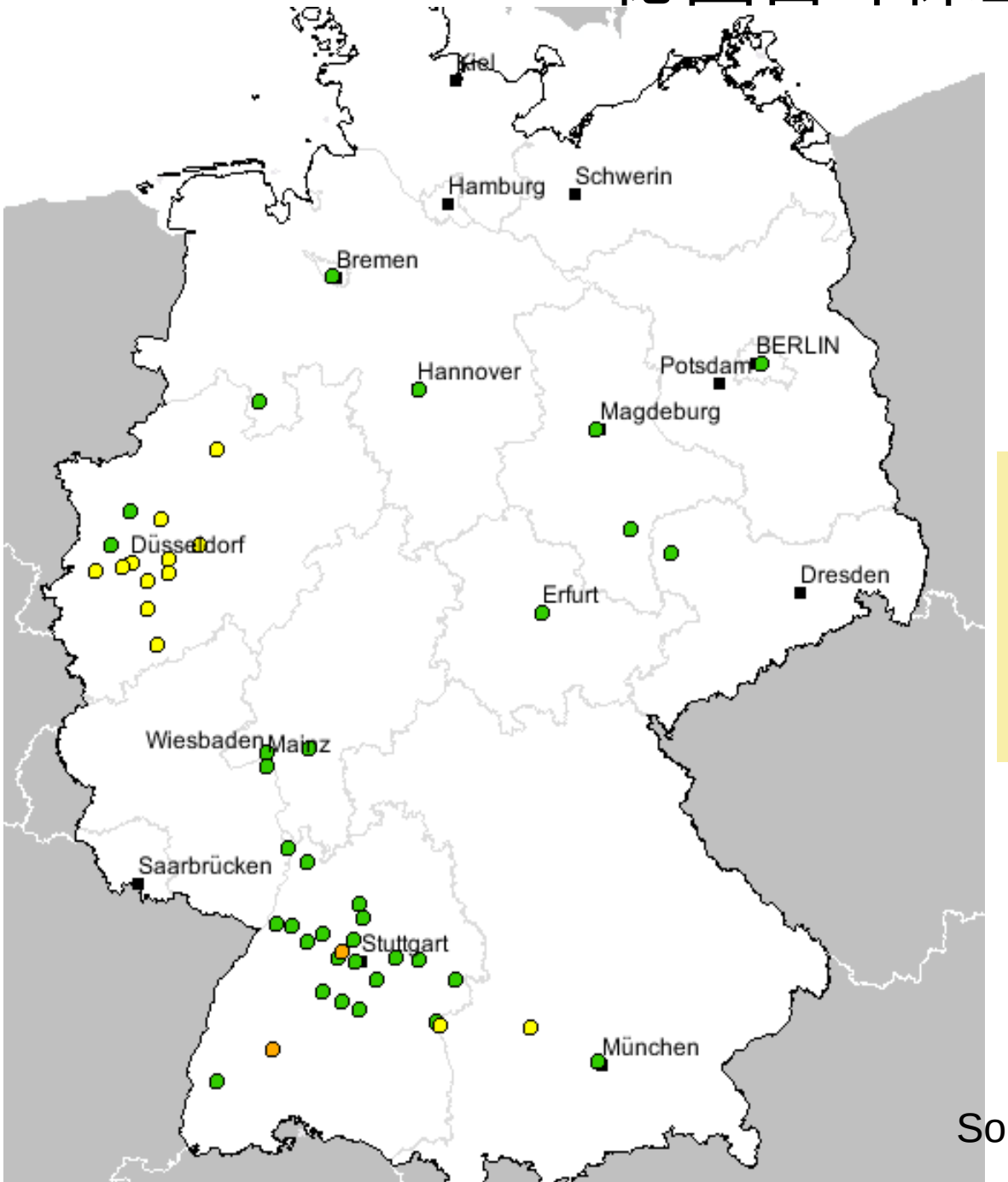
PM < **50 mg/km**, (Emission limit Euro 3).This limit can also achieved by retrofit.（欧3 排放限值）该限值也可通过改装实现。

- **Green Group 绿色标签组**

PM < 25 **mg/km** (Emission limit Euro 4)This limit can also achieved by retrofit.（欧4排放限值）该限值也可通过改装实现。

Emissions class 排放等级	1	2	3	4
Sticker 带标签	No Sticker 不带标签			
Requirement for diesel vehicles 针对柴油车辆的要求	Euro 1 or worse 欧1 或更糟	Euro2 or Euro1 + particulate filter 欧1或欧2 + 颗粒过滤器	Euro3 or Euro2 + particulate filter 欧3或欧2 + 颗粒过滤器	Euro4 or Euro3 + particulate filter 欧4或欧3 + 颗粒过滤器
Requirement for petrol vehicles 针对汽油车辆的要求	Without a catalytic converter 未带催化转换器			Euro1 with catalytic converter or better 欧1 带催化转换器或者更佳

Environmental Zones in Germany
德国各环保区



Entrance only with yellow or green sticker
仅允许带黄色或绿色标签车辆进入

Entrance only with green sticker
仅允许带绿色标签车辆进入

Source:http://www.IUmweltbundesamt.de

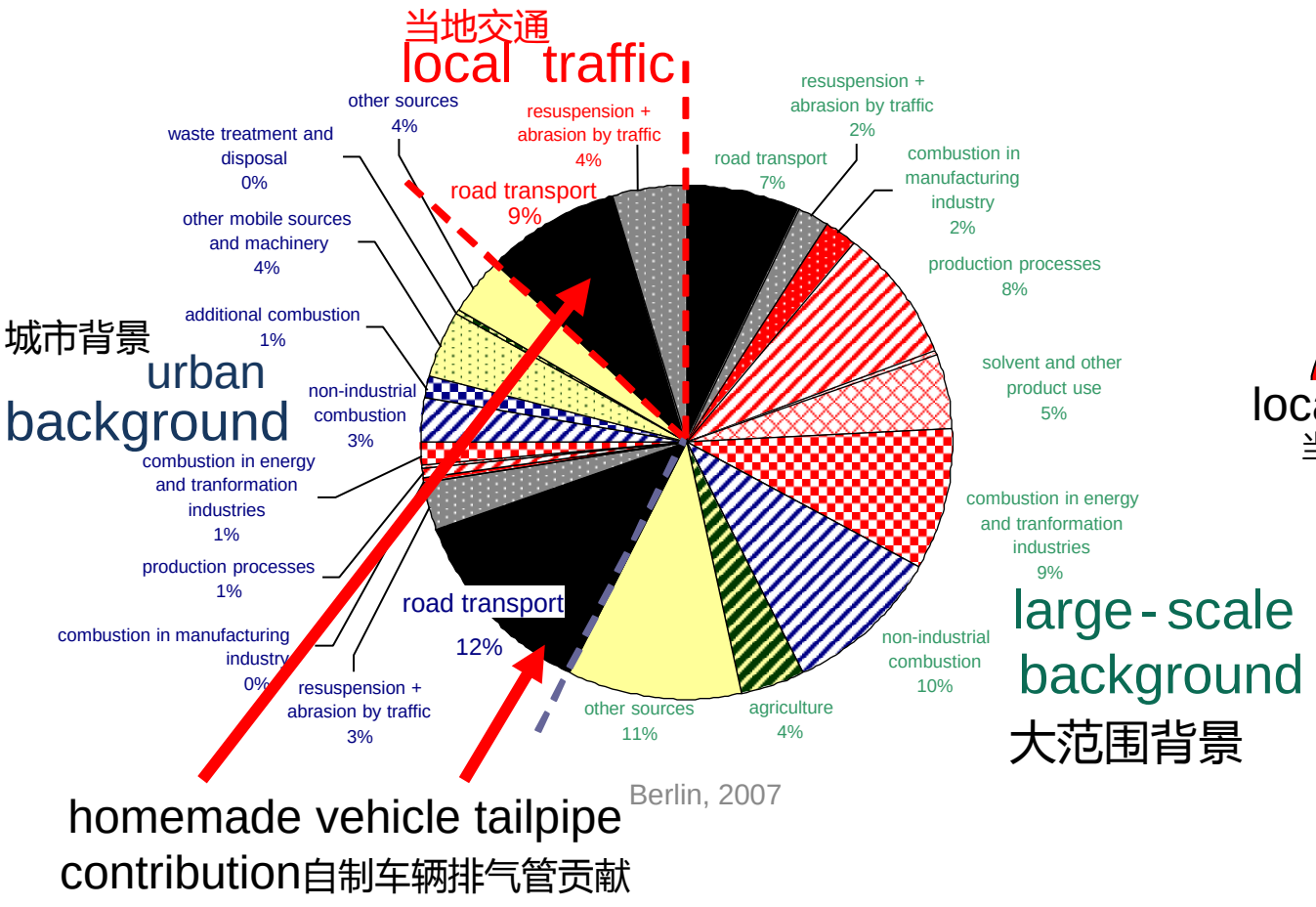
Low Emission Zones in Europe
欧洲低排放区

Source: http://www.lowemissionzones.eu/

Berlin
柏林

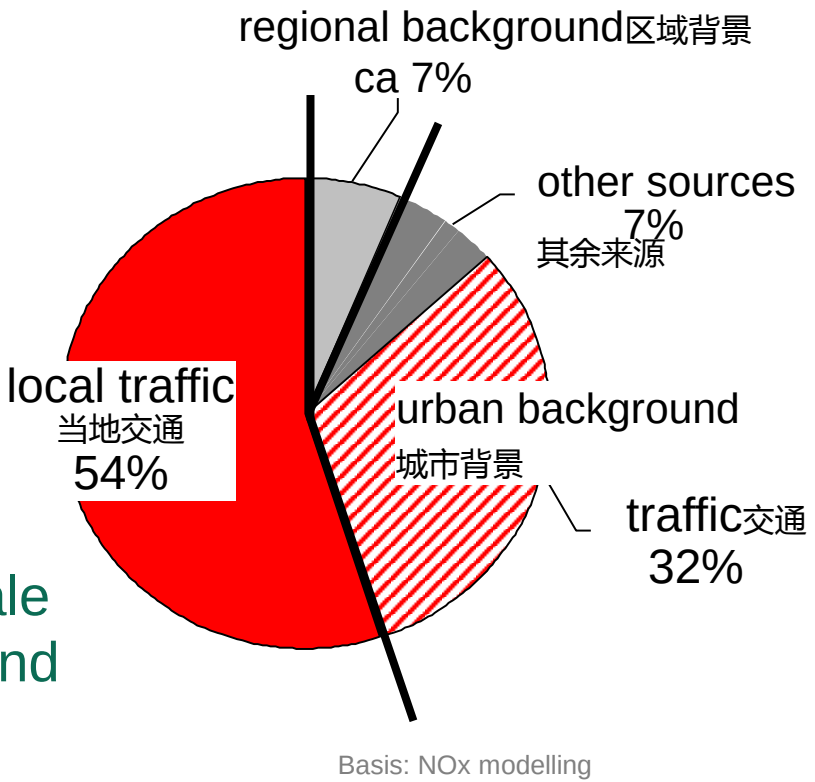
Origin of Kerbside PM2.5 and NO2 in Berlin
柏林街边PM 2.5 和NO2排放来源

sources of roadside PM2.5 pollution
街边PM2.5污染来源



Berlin, 2007

sources of roadside NO2 pollution
街边NO2污染来源



Basis: NOx modelling

Air Quality Management in Berlin（1）
柏林空气质量管理（1）

- Berlin has had serious problems with ambient particulate matter (PM) pollution
  柏林的大气颗粒污染问题一度非常严重
  - huge excess of EU air quality standards more than a decade ago

    十余年前，欧盟空气质量标准一度大量过剩
  - even now remaining risk of exceedances in year with „difficult“ weather conditions

    即使是现在，过剩带来的持续风险和恶劣的天气条件一并成为问题

Air Quality Management in Berlin（2）
柏林空气质量管理（2）

- Berlin has focused on Diesel soot emission control 柏林一直专注于柴油烟尘排放控制
  - ↳emphasis on health benefits as soot particles are considered the most toxic PM component

    强调健康效益，因为烟尘颗粒被认为是可吸入颗粒物中最有毒的成分

    - ☞recent WHO classification in highest category of cancerogenous substances

      根据最近世界卫生组织分类显示其为最高一类致癌物质

Air Quality Management in Berlin（3）
柏林空气质量管理（3）

- Berlin has focused on Diesel soot emission control 柏林一直专注于柴油烟尘排放控制
  - soot particles contribute to climate change

    烟尘颗粒是造成气候变化的原因之一
  - cost-efficient Diesel particle filter (DPF) technology exists

    拥有符合成本效益的柴油颗粒过滤器技术
  - important element of Berlin's strategy to attain the particle pollution standards

    这也是柏林达到颗粒污染标准战略的重要元素

Air Quality Management in Berlin 柏林空气质量管理（4）

Emphasis on Diesel exhaust control 重点在柴油车尾气控制

- Berlin has a long tradition in tackling Diesel soot emissions…

柏林在应对柴油尾气排放问题领域历史已久

– already in 1999 launch of a filter retrofit programm of Berlin‘s fleet of 1400 Diesel buses, resulted in

早在1999年就推出了柏林市1400辆柴油巴士过滤器改装工程，成果为：

- > 90% reduction of Diesel soot emissions

柴油烟尘排放减少90%以上

- - 37 t/a Diesel soot emissions

柴油烟尘排放减少37吨/年

Air Quality Management in Berlin 柏林空气质量管理（5）

Emphasis on Diesel exhaust control 重点在柴油车尾气控制

- Berlin has a long tradition in tackling Diesel soot emissions…

柏林在应对柴油尾气排放问题领域历史已久

SOLARIS Urbino 18 Euro III

2005 adopted a low emission zone for motor vehicles

2005年引进机动车辆低排放区

- more 60.000 vehicles retrofitted with DPF

超过 60.000 机动车辆参与柴油颗粒过滤器改装

- 60% Diesel soot emissions, 柴油烟尘排放减少60%
- 175 t/a in total Diesel emissions from road traffic

道路交通带来的柴油排放减少175吨/年

- 30 t/a diesel emissions of heavy goods vehicles > 3.5t

> 3.5t重型货车带来的柴油排放减少了30吨/年

Air Quality Management in Berli柏林空气质量管理（6）

Emphasis on Diesel exhaust control 重点在柴油车尾气控制

–successful demonstration project on DPF retrofit of passenger cruising ships

成功示范项目 - 乘客巡航船柴油颗粒过滤器改装

- retrofit of 3 vessels with different filter systems with promising results:

分别使用不同过滤系统，改造3搜船只并取得了可喜的成果：

- >90% filter efficiency, no extra fuel consumption

过滤效率大于90%，无多余的燃油消耗

- successful filter regeneration even under difficult operation conditions

尽管操作条件困难，还是成功完成过滤器再生

Berlin Environmental Zone 柏林环保区

Emission Criteria 排放标准

Stage 1: since 1.1.2008

- Diesel vehicles: at least Euro 2 or Euro 1 & retrofit
- Gasoline vehicles: at least Euro 1
- 7% of vehicle fleet affected

Stage 2: since 1.1.2010

- Diesel: Particle emission Euro 4:
- cars: Euro 3 + particle filter or better
- goods vehicles: also retrofit of Euro 1-3 towards Euro $4_{Particle}$
- 10% of the vehicle fleet affected

Area:

about 88 km²
(Berlin total area: 892 km²)

Inhabitants:

about 1 Million

(Berlin total: 3,4 Mio)

在德国，有40个计划/实施中的低排放区；欧盟一共有30个低排放区，但排放标准都不一样

more than 40 LEZ planned/in force in Germany, 30 LEZ in the EU, but with different emission criteria

Air Quality Management Berlin

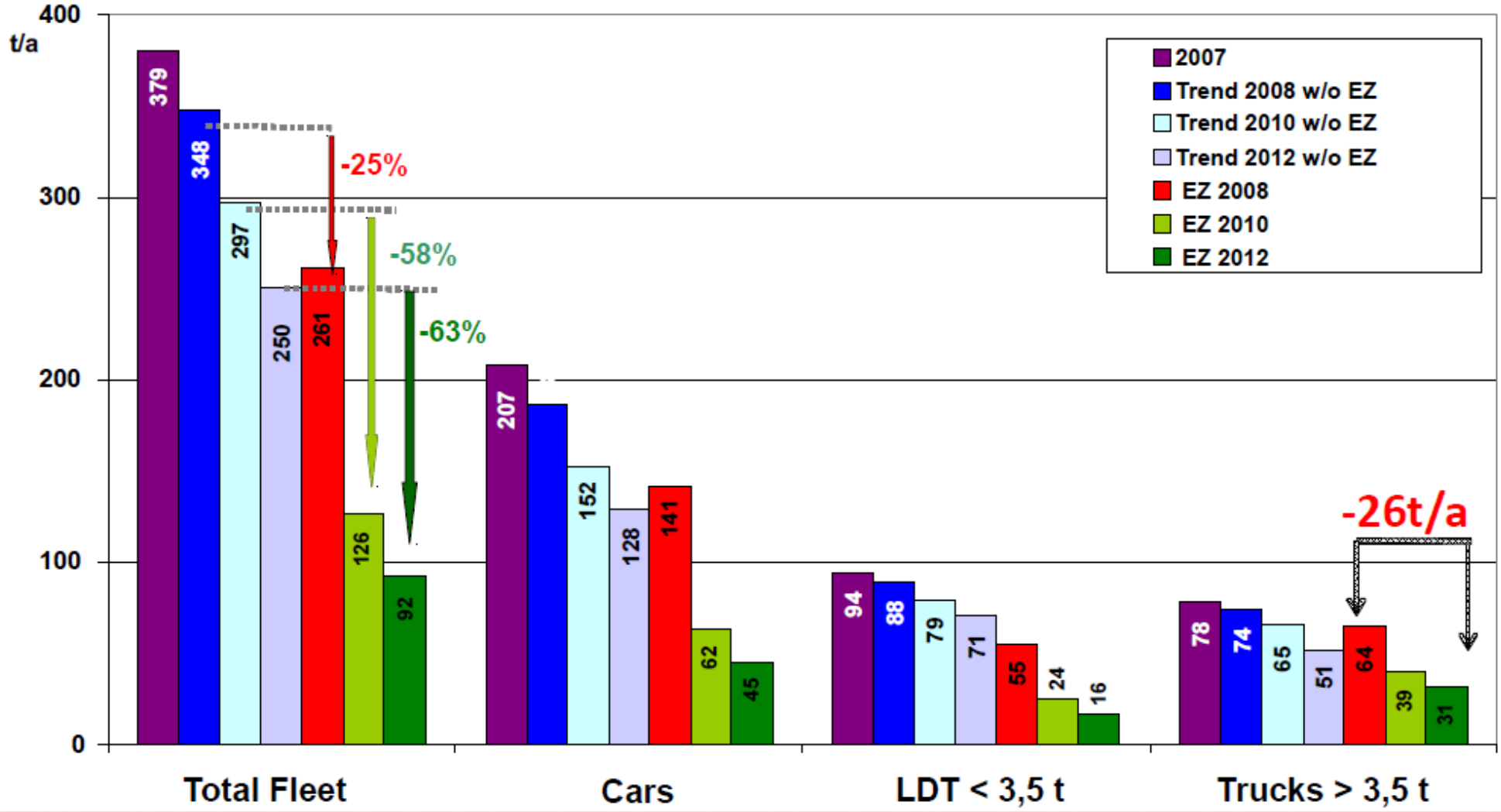
柏林空气质量管理

利用环保区减少柴油烟尘排放

Reduction of Diesel Soot-Emissions by the EZ

根据法兰克福大道所观测车流量

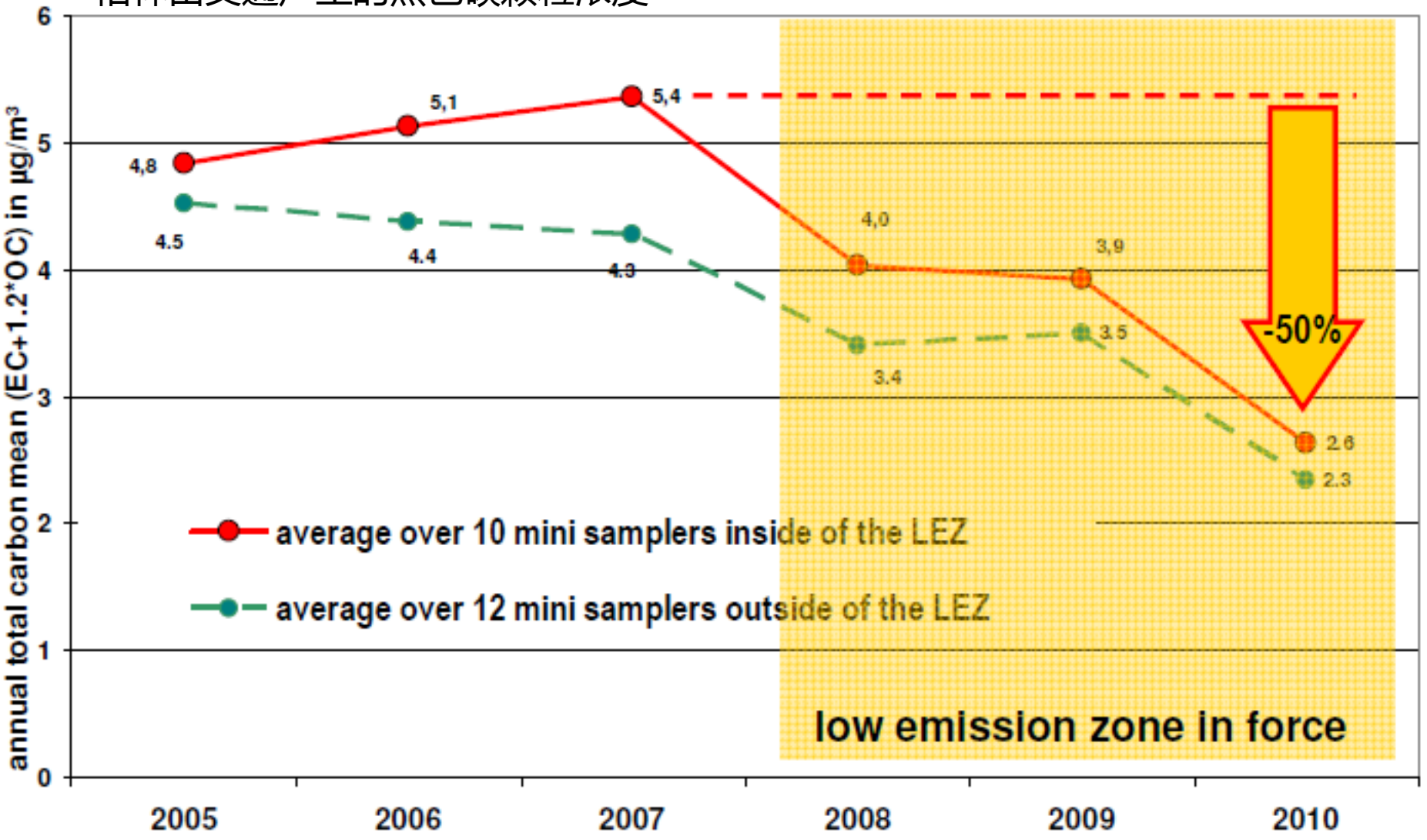
anhand der beobachteten Flottenzusammensetzung an der Frankfurter Allee



Berlin Environmental Zone Impact 柏林环保区影响

traffic related* black¥ carbon particle concentration in Berlin

柏林由交通产生的黑色碳颗粒浓度



* local BC increment at traffic sites, adjusted to traffic volumes trend relative to 2007 before LEZ came into force

¥ elemental carbon (EC) particles plus other deposited organic compounds (OC)

Senatsverwaltung für Gesundheit, Umwelt und Verbraucherschutz, Referat III D, M. Lutz

Estimation of the positive health impact by the Environmental Zones (EZ) in Berlin and Munich 柏林和慕尼黑环保区对健康积极影响预估

Reduction of traffic related diesel particle concentrations by implementation of the EZ by about 60% in Berlin and about 30% in Munich 实施引进环保区后，由交通产生的柴油颗粒浓度在柏林降低约60%，慕尼黑约30%

Early death rate by diesel particle in urban areas in Germany 240 of 1 Million in inhabitants在德国城市地区，由柴油颗粒引起的过早死亡率为240人/百万居民

Impact of EZ inside and outside the same 环保区内外影响相同

	Berlin 柏林	**München慕尼黑**
Inhabitants 居民	~ 3.530.000	~ 1,430.000
All death cases per year 每年所有死亡案例	~ 31.000 (100%)	~ 11.000 (100%)
Avoided death cases per year through the EZ 引进环保区后，每年所避免的死亡案例	~ 500 (1,6%)	~ 100 (0,9%)

Basic assumptions: BC reduction by the EZ in Berlin 60%,

in Munich only 30% because the EZ is not as strict 基本假设：实施环保区后柴油颗粒浓度在柏林减少60%，而慕尼黑仅30%，是因为在慕尼黑的实施不够严格

500 premature death per avoided in Berlin, 100 in Munich by the implementation of the EZ 实施环保区后，柏林每年所避免的死亡案例为500 例，慕尼黑为100例

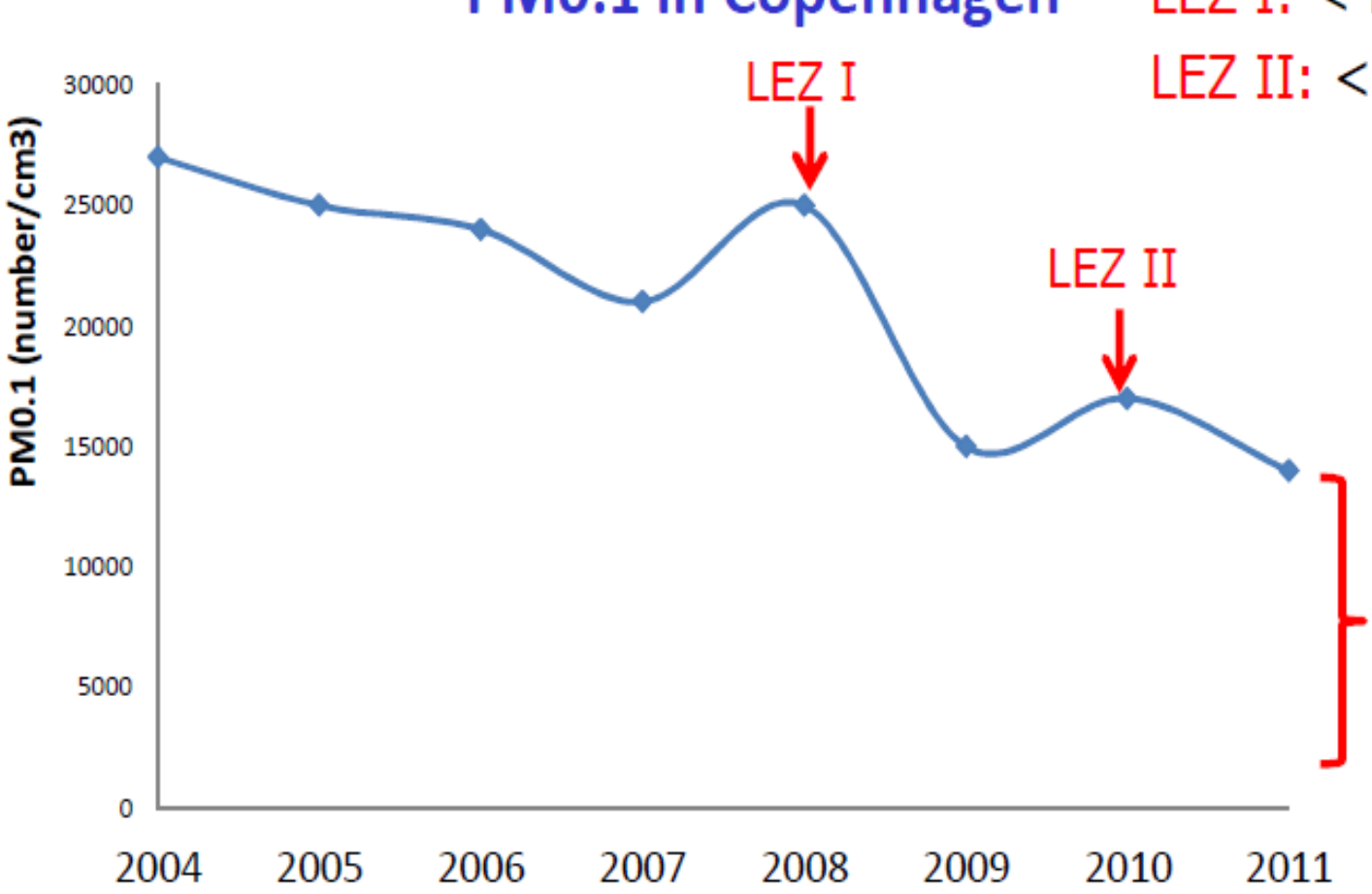
Copenhagen
哥本哈根

UFPs in street air 街道空气中的超微粒子

Closed particulate filters:

LEZ I: < EURO III HDV

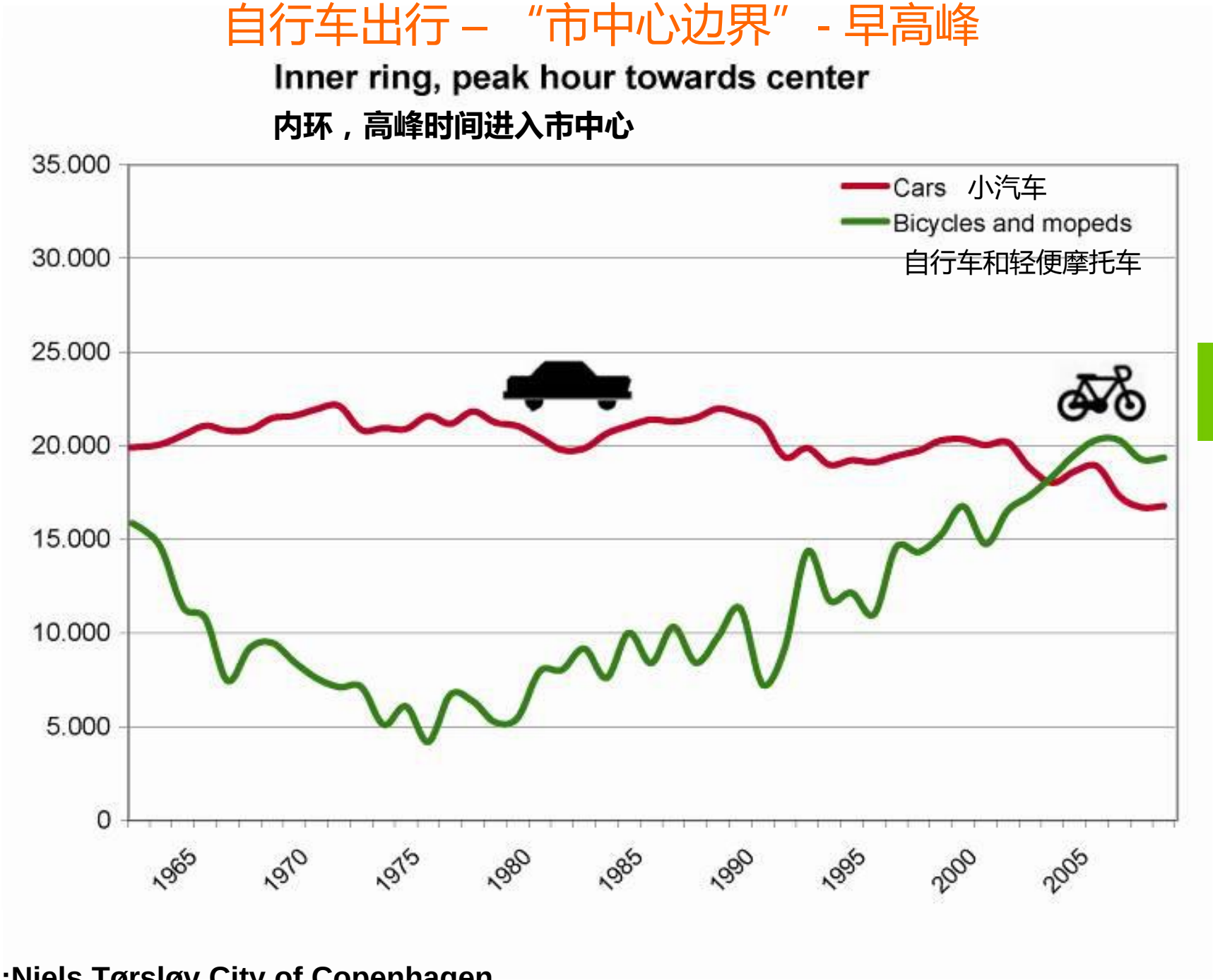
LEZ II: < EURO IV HDV



Local exhaust !
Can be reduced
by stricter LEZ
in Copenhagen.

THE DANISH ECOCOUNCIL

Cycling - “Søsnittet” - morning peak
自行车出行 – “市中心边界” - 早高峰



Source:Niels Tørsløv City of Copenhagen

Copenhagen: Cycling today
哥本哈根：自行车出行在今天

- 1.2 million km cycled every day

  每天自行车行驶里程为120万公里

- 37% arrive at work or education on bikes

  在工作或受教育人群中，37%选择自行车出行

- 60% of Copenhageners choose their bike on all trips

  60%的哥本哈根居民选择自行车出行

Source:Niels Tørsløv City of Copenhagen

Copenhagen: 2015 goals on cycling ..
哥本哈根：2015年自行车出行的目标...

- **Increase commuter share from 37% to 50%**

  使通勤率从37%增长到50%

- **50% reduction in accidents**

  减少50%的交通事故

- **Increase the feeling of safety from 50% to 80%**

  道路安全感从50%提高至80%

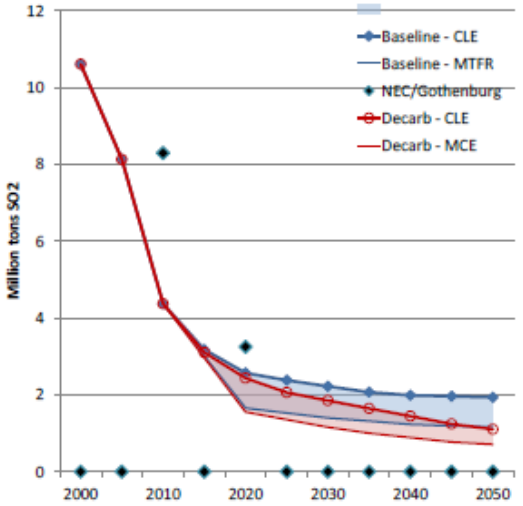
Source:Niels Tørsløv City of

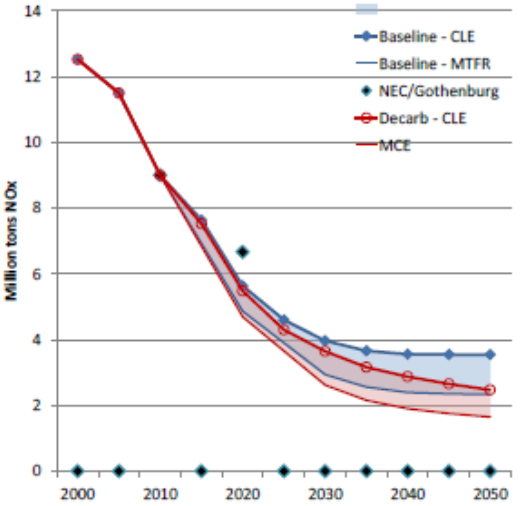
欧盟空气质量政策回顾

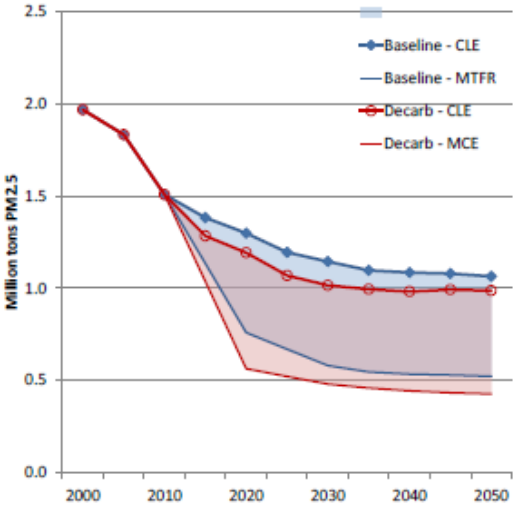
我们如何去了解它的综合评估模型

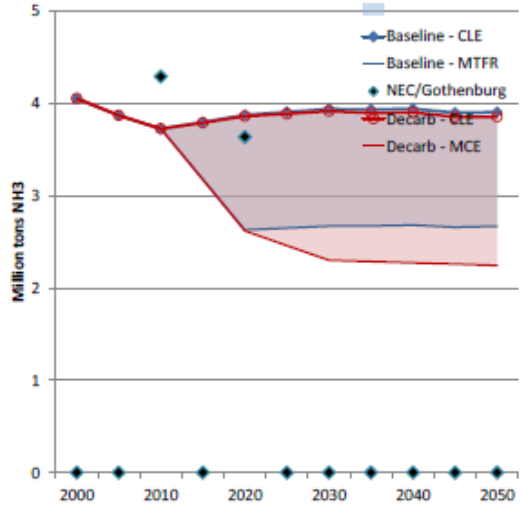
The Review of the EU Air Quality Policies

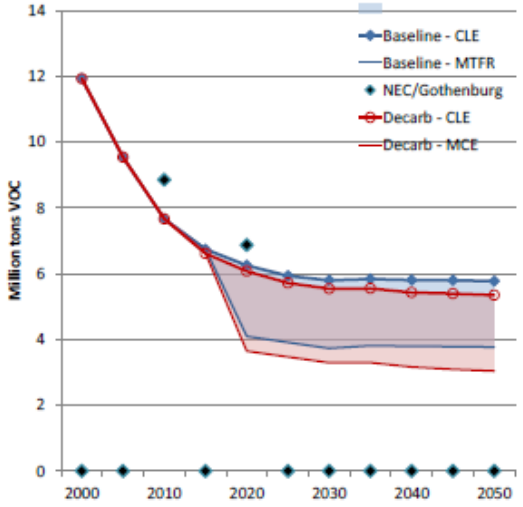
How we go about it: the integrated assessment modeling











European Commission

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CMR
CAMARO

I have a Dream: 我有一个梦想:
Copenhagen is everywere!
最好世界上到处都是哥本哈根！

Congestion in the rush hour in Copenhagen 哥本哈根的早晚高峰

Soure: Fairkehr, April 2008