Real-world car emission estimations – a more accurate approach
实际排放差异分析
– 一个更精准的方法

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September 2016

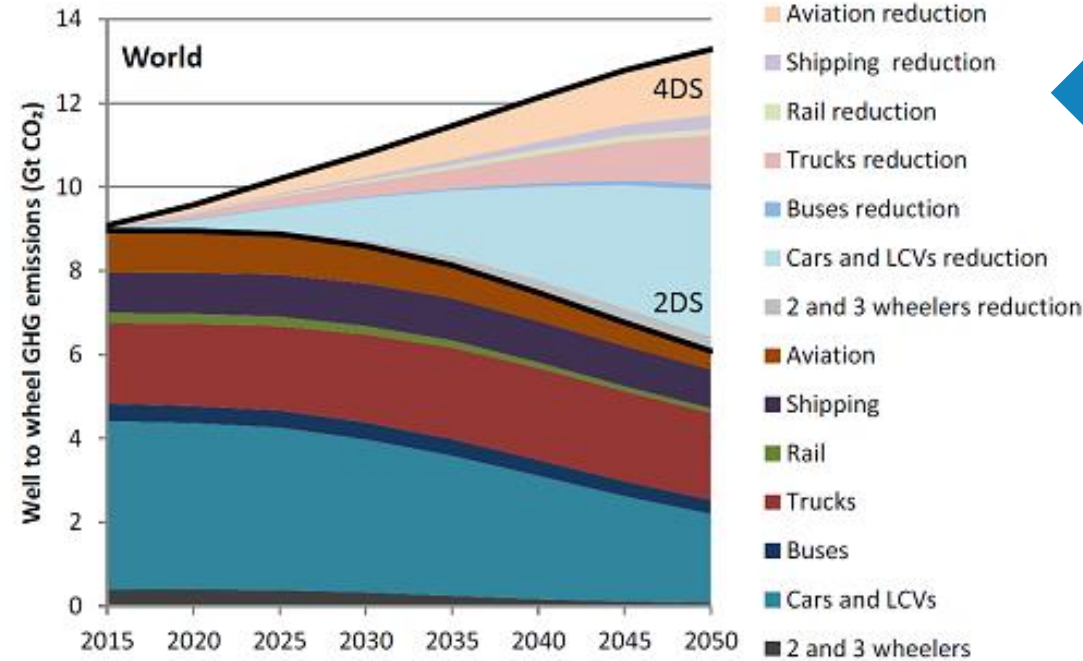Dave.OudeNijeweme@E4tech.com

内容

- What are the issues?

- What did we do?

- What did we find?

- How can we improve?

- Conclusions & recommendations

What are the issues?

Significant transport improvements are required to meet the Paris Agreement and improve urban air quality
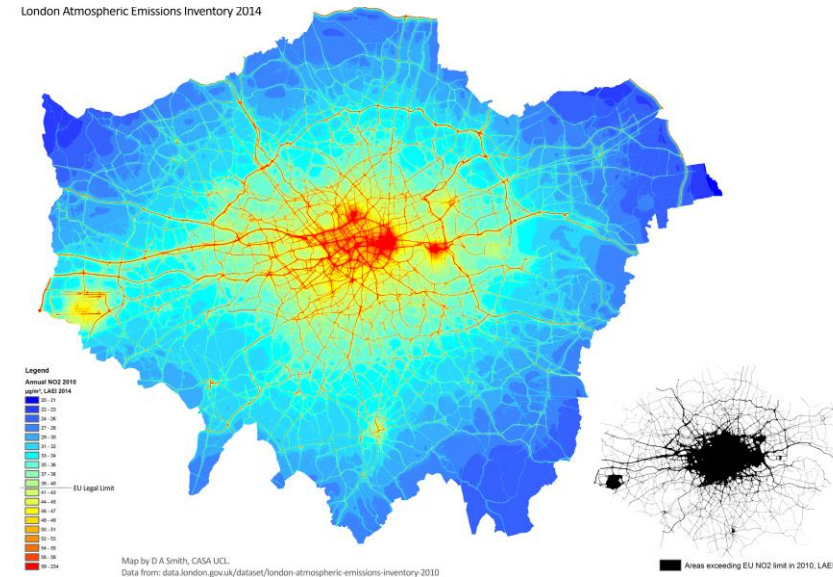## 为满足巴黎协议及提升城市空气质量，交通亟需改善

Transport GHG contributions - IEA

Source: International Energy Agency

Global

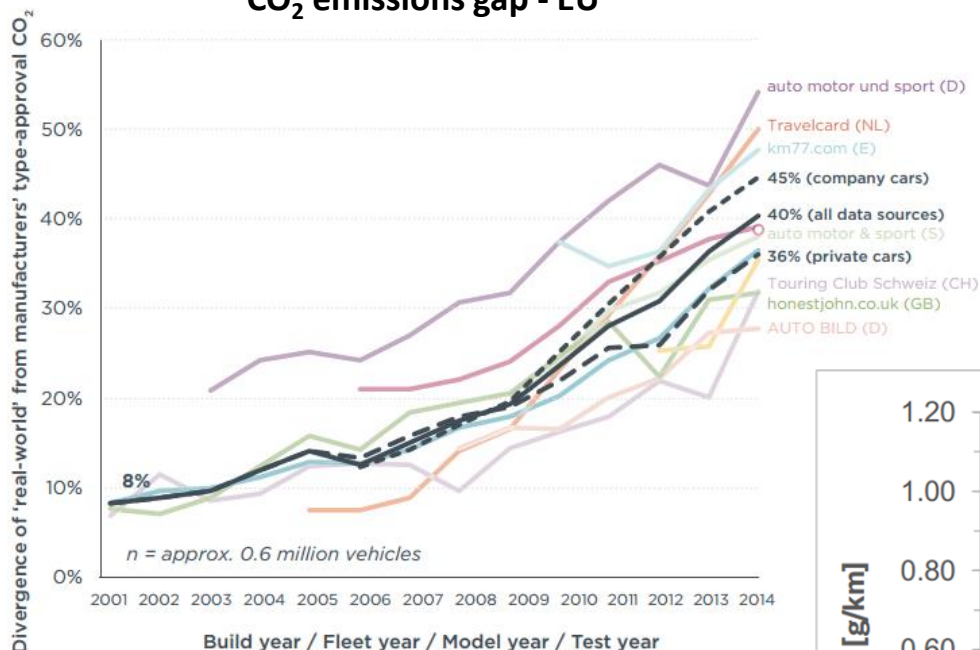**London annual NO$_2$ concentration**

Local

https://citygeographics.org/2015/10/20/what-can-the-next-mayor-do-to-tackle-londons-hazardous-air-pollution/

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'Real world' deviation in both fuel economy and pollution performance真实世界的差异同时存在于燃料经济性及排放
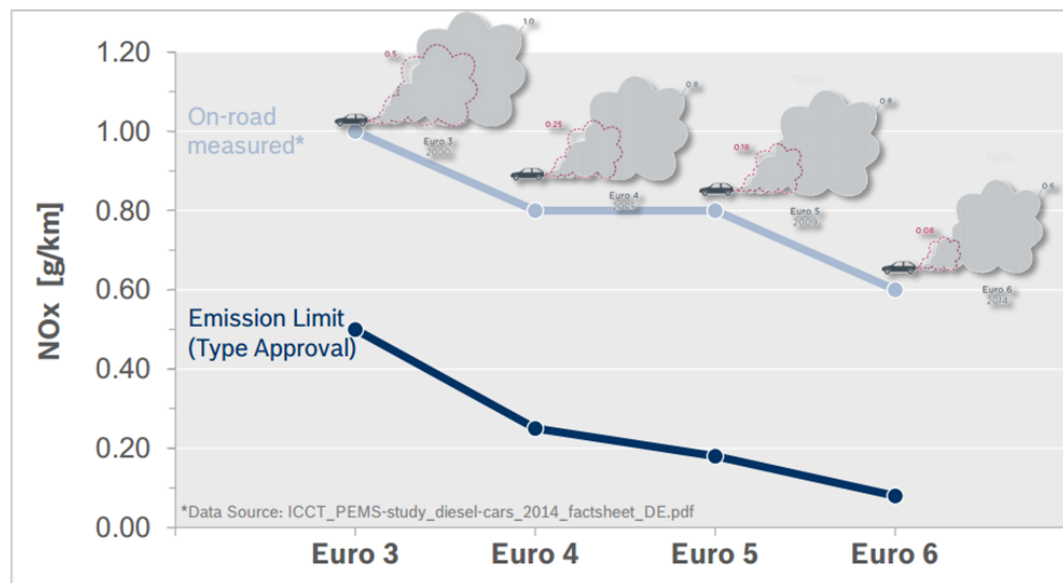
CO$_2$ emissions gap - EU

- auto motor und sport (D)
- Travelcard (NL)
- km77.com (E)
- 45% (company cars)
- 40% (all data sources)
- auto motor & sport (S)
- 36% (private cars)
- Touring Club Schweiz (CH)
- honestjohn.co.uk (GB)
- AUTO BILD (D)

8%

n = approx. 0.6 million vehicles

Source:http://www.theicct.org/sites/default/files/Fact%20sheet_FromLabToRoad_2015.pdf
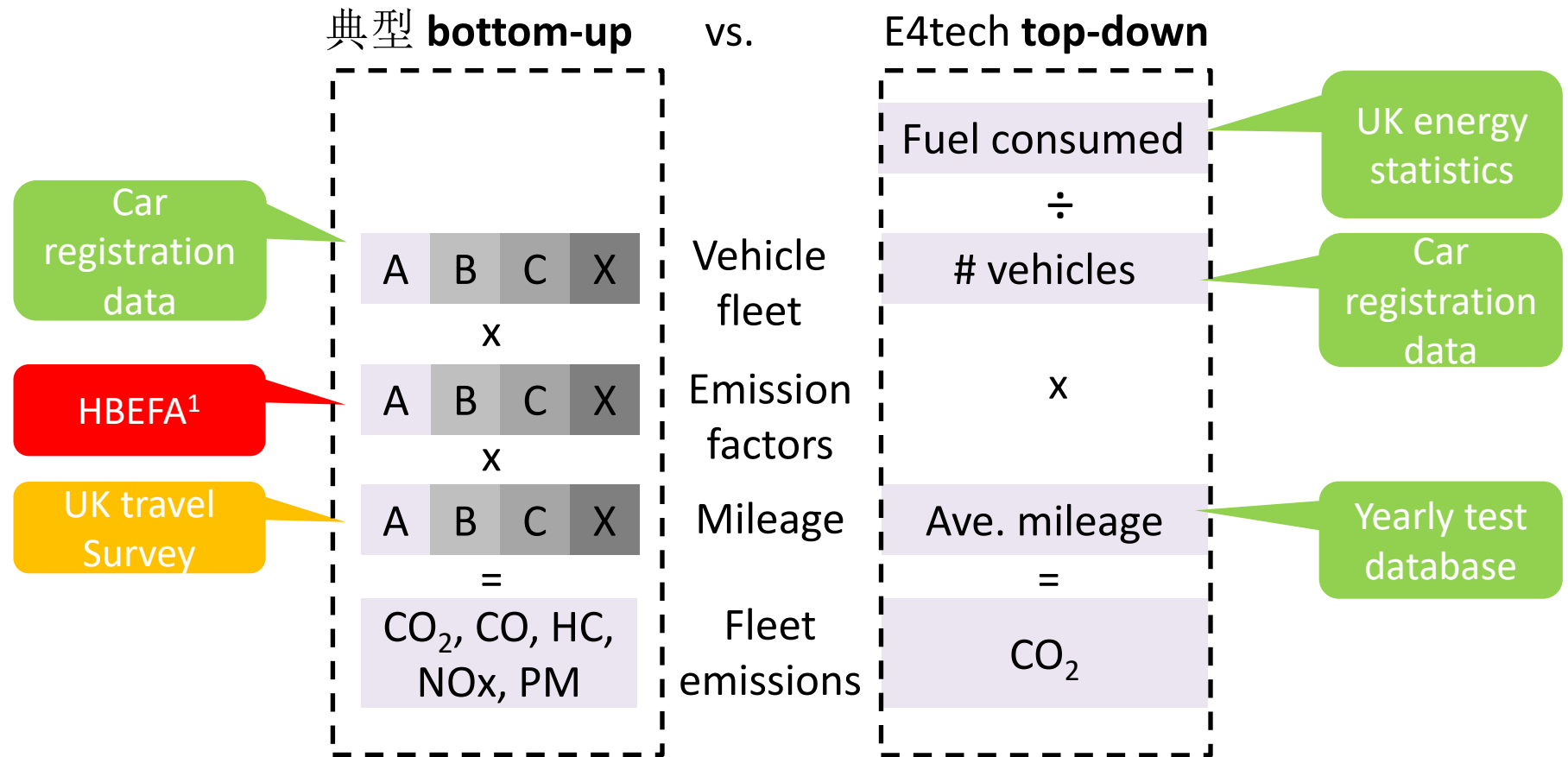
Gap – 油耗

Gap – 污染物

NO$_x$ emissions gap - EU

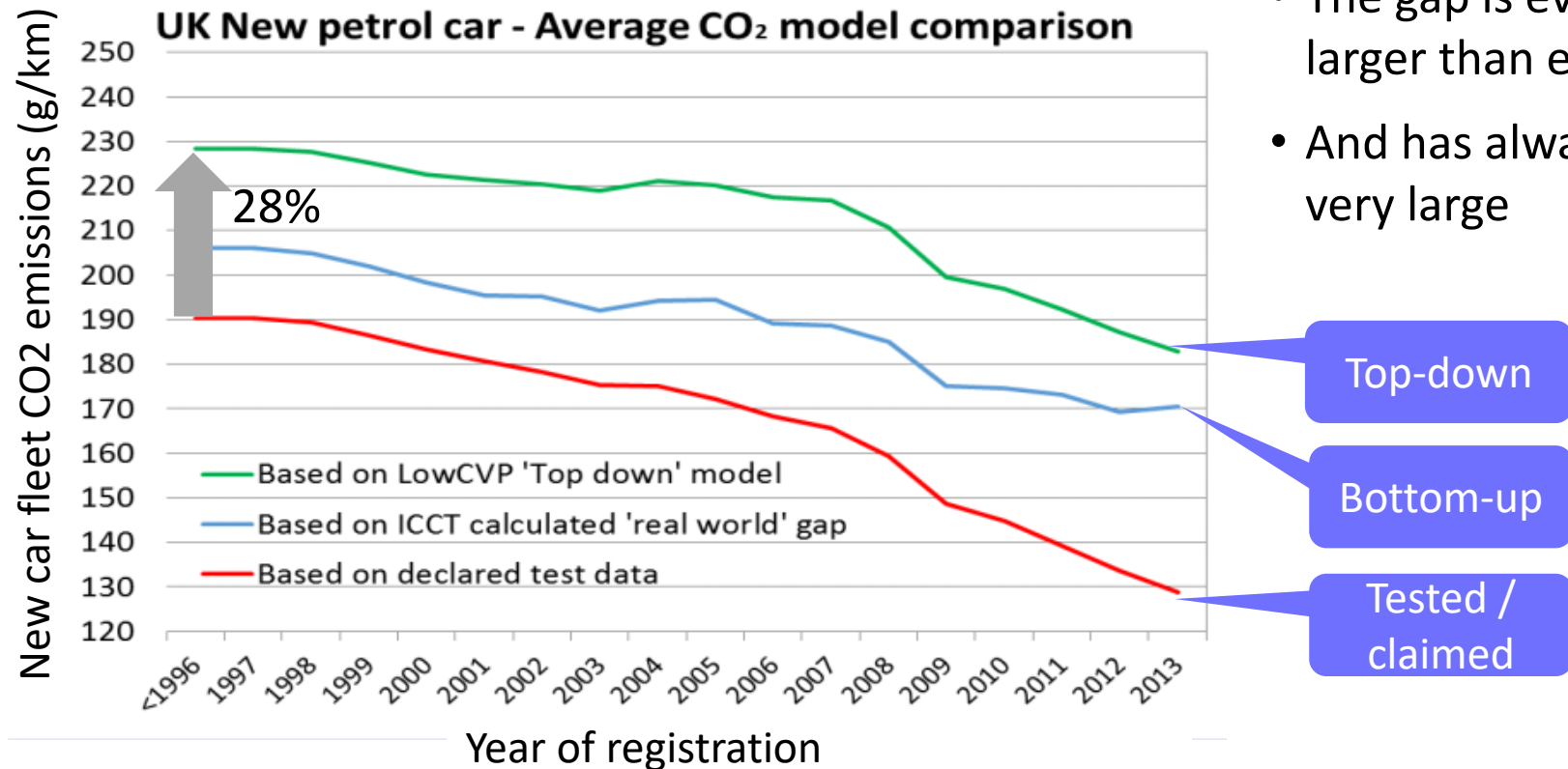*Source: E4tech analysis & ICCT PEMS study diesel cars 2014 factsheet*

What did we do?

实际排放估算通常采用自下而上方法，我们应用更精准的自上而下的方法。

典型 **bottom-up**　　vs.　　E4tech **top-down**

Car registration data

| A | B | C | X | Vehicle fleet |

x

HBEFA[1]

| A | B | C | X | Emission factors |

x

UK travel Survey

| A | B | C | X | Mileage |

=

CO_2, CO, HC, NOx, PM　Fleet emissions

Fuel consumed　　UK energy statistics

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vehicles　　Car registration data

x

Ave. mileage　　Yearly test database

=

CO_2

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[1]HBEFA 　　= the European Handbook for Emissions factors

x 　　= Input source & quality indicator. Green = reliable, Amber = OK, Red = unreliable

A　B　C　X 　　= Vehicle fleet split by type of vehicles or emission levels

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What did we find?

结果表明真实CO2排放差异比ICCT等得到结果更大

UK New petrol car - Average CO_2 model comparison

New car fleet CO2 emissions (g/km)

28%

Year of registration

- Based on LowCVP 'Top down' model
- Based on ICCT calculated 'real world' gap
- Based on declared test data

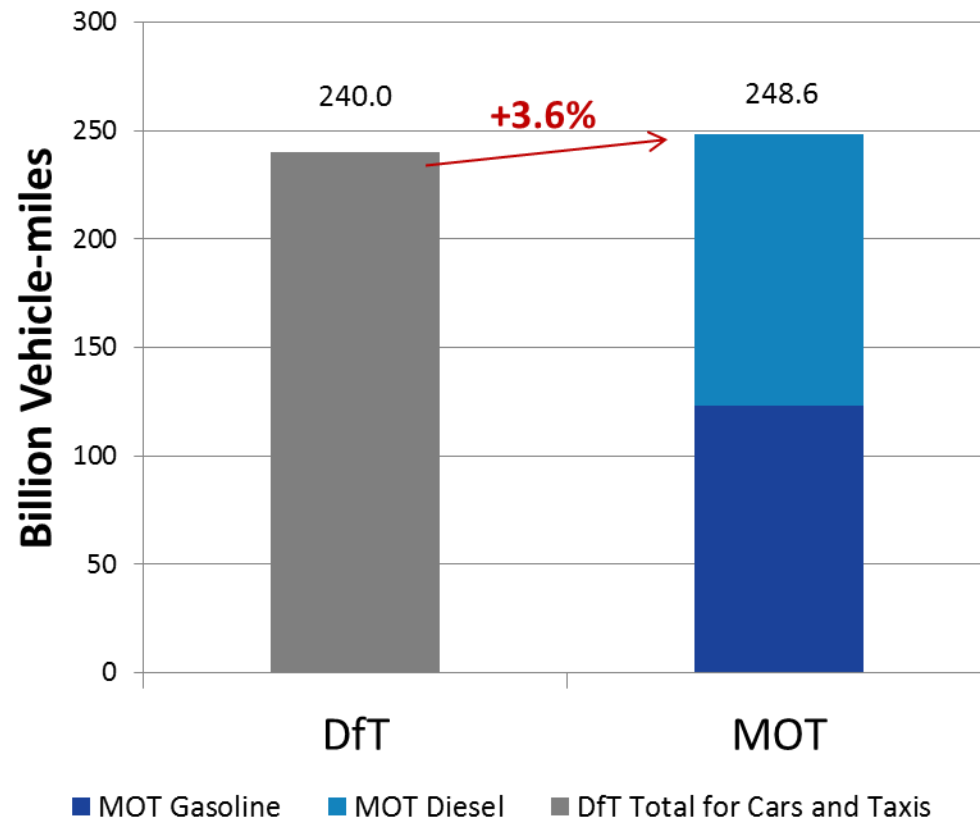Top-down

Bottom-up

Tested / claimed

- The gap is even larger than expected
- And has always been very large

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Why? 比较2013年车辆出行公里数：MOT* 数据V.S.调查数据（DfT）

- Comparing the travel survey data with the MOT database in 2013 shows that the MOT* value is **3.6% higher** than the UK's National Travel Survey

- This explains some of the difference, but certainly not all of it

*MOT= Annual roadworthiness test

Comparison of vehicle-miles driven in 2013 – Official survey vs yearly test database

- MOT Gasoline
- MOT Diesel
- DfT Total for Cars and Taxis

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问题一定在于所用的排放因子

CO2 emissions from HBEFA & UK gasoline fleet - NEDC conditions

Legend:
- 1.4l<cc<2.0l
- cc<1.4l
- UK - gasoline REAL

- Overlaying HBEFA average fleet with UK average fleet

- Indication that emission factors are optimistic

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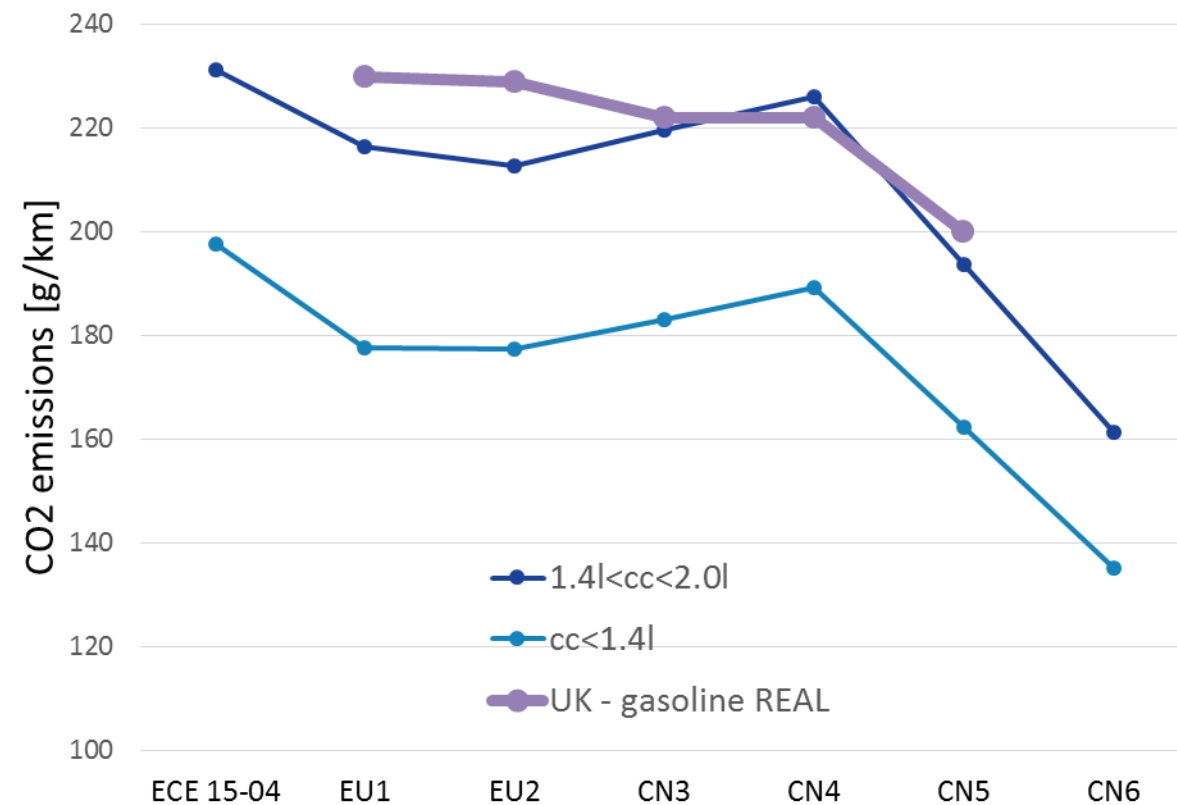
汽油车队 "真实" CO_2 排放比官方结果高出 **8Mt CO_2** (in 2013)

- "官方" 结果**:** New car data from OEMs * number of vehicles * average mileage

- "真实" 结果**:** Total gasoline consumption / total number of vehicles and average mileage

- The gap was found to be **25.9%** for gasoline cars which is equivalent to **8 Million Tonnes of CO_2 in the UK in 2013**

Comparison of 'official' versus 'real' CO2 emissions of the gasoline car parc in 2013

CO2 emissions (g/km)

165.5   +25.9   208.4

"Official" results   "Real" results
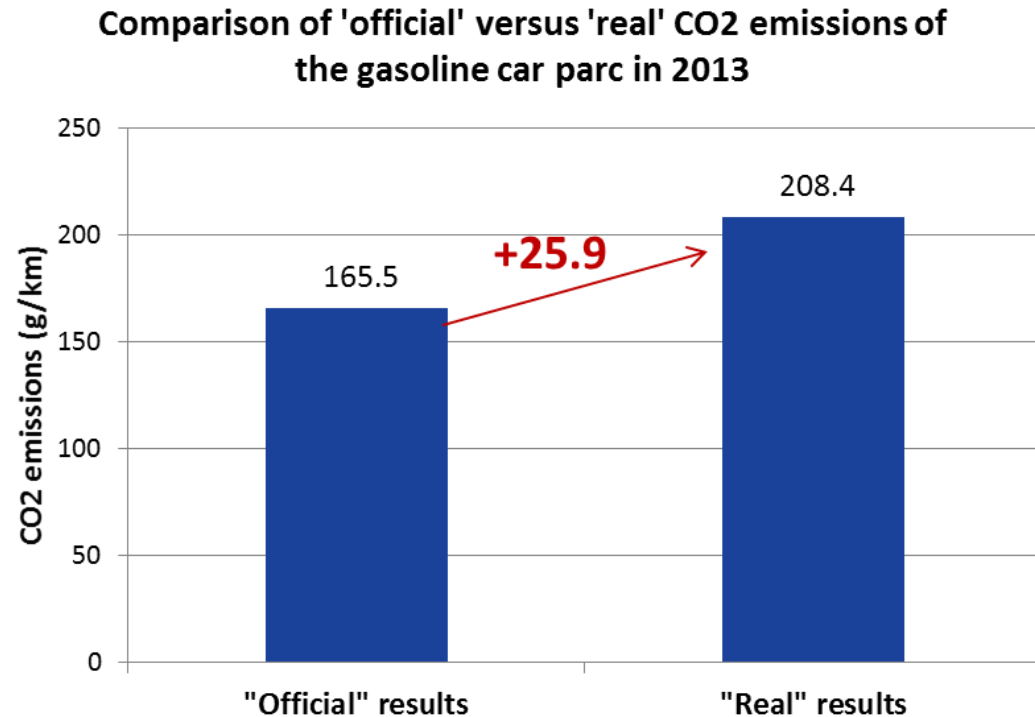
- Extending this logic it is reasonable to expect that this also applies to:

  - Other vehicles in the UK

  - All vehicles in Europe

  - Pollutant emissions for all vehicles in Europe

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What can be improved?

由**E4tech** 及**iCET**联合开发的**CUTEC** 排放计算工具为决策者提供参考依据

China Urban Transport Emissions Calculator is split into 3 layers:

1. **High-level user input and output**

   `DASHBOARD`

   This tab is for a user who does not require a detailed understanding of the interdependencies between detailed inputs but wants to compare various pre-prescribed scenarios. Includes an input dashboard and key graphical outputs.

2. **Advanced user input**

   `BASELINE advanced inputs` `SCENARIO advanced inputs`

   Tabs dedicated to prescribing various scenarios and all other detailed inputs. Requires advanced understanding of how different policies affect vehicle stock and vehicle-kilometres travelled (VKT) in a city. There are two separate tabs for setting the baseline and for the scenario.

3. **Mechanics of the tool**

   `BASELINE Vehicle Stock` `BASELINE Vehicle KMs Travelled` `BASELINE VKT Policies` `BASELINE Emission factors`
   `SCENARIO Vehicle Stock` `SCENARIO Vehicle KMs Travelled` `SCENARIO VKT Policies` `SCENARIO Emission factors`
   `Combined outputs`

   The tabs that follow user inputs form the back-end of the calculator where all calculations are taking place. They do not require any user input and it is not recommended to change the formulas within.

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图表界面展示关键的输入及输出
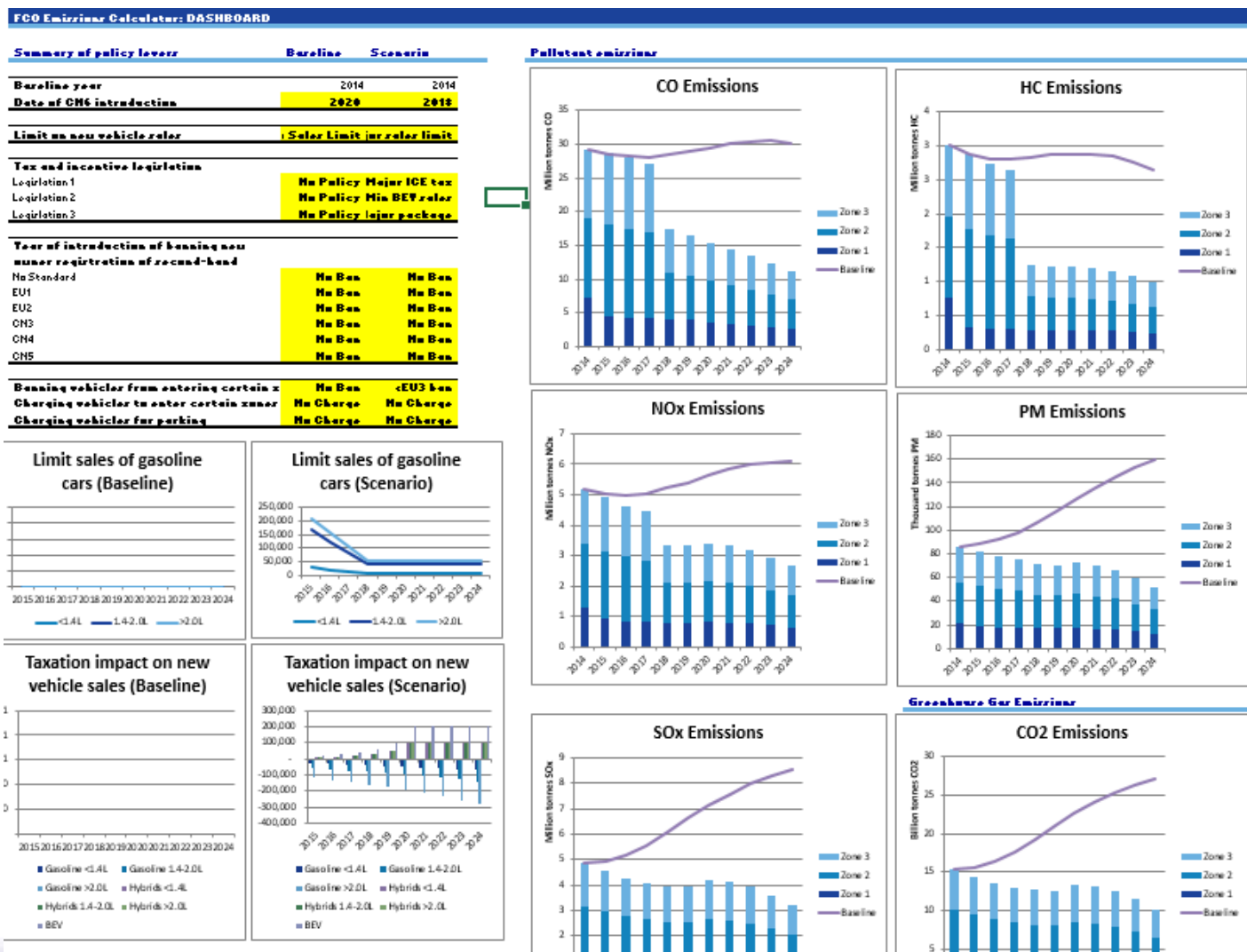
比较不同来源的排放因子，表明HBEFA的排放因子需进一步改进

- Having piloted **CUTEC** for the city of Shenzhen it became apparent that HBEFA emission factors are fairly optimistic

- See below comparison of the HBEFA pollutant emission factors with the EU emission limits under New European Drive Cycle (NECD) type conditions
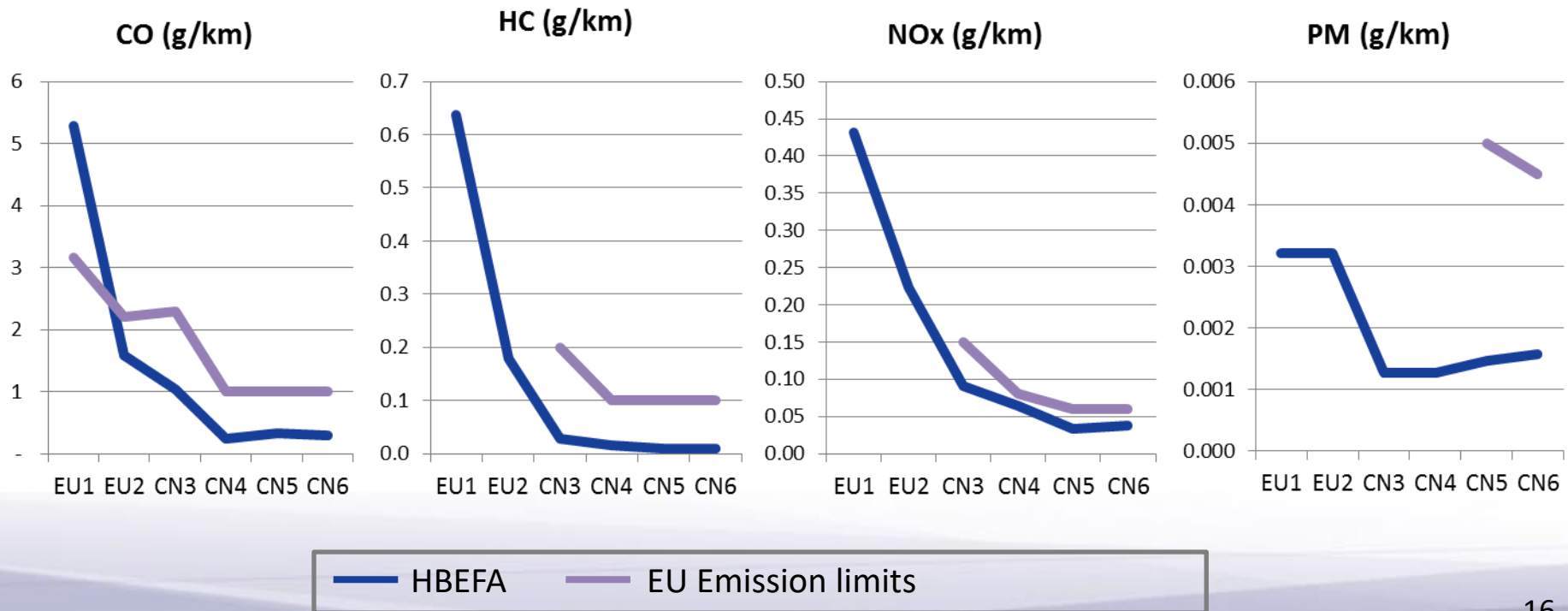
结论 & 建议

结论 & 建议

结论

- UK 汽油车的CO_2 排放低估了约28%

- 标准的排放因子为主要原因

- 污染物的排放因子同样并不准确

导致

- 模型明显低估了车辆CO_2 及污染物排放

- 被误导的政策

建议

- 车队CO_2 排放应同时采用top-down 和bottom-up 方法来确保精准度

- 排放因子亟待优化

- 应用更多工具如CUTEC来协助政策制定

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For more information please visit our website:

www.E4tech.com

Or contact us in London or Lausanne:

E4tech (UK) Ltd

83, Victoria Street
London SW1H 0HW
United Kingdom

+44 (0)20 3008 6140

enquiries@e4tech.co.uk

E4tech Sàrl

Av. Juste-Olivier 2
1006 Lausanne
Switzerland

+41 (0)21 331 15 70

enquiries@e4tech.ch