Quantifying transport emissions
交通排放量化

Urda Eichhorst 云明慧

Training on Emission Quantification and Monitoring in Urban Transport

城市交通碳排放监测评价方法和数据采集培训

03.11.2014

排放计算的原因
Reasons for Emissions Accounting

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Understand the current problem (in detail):
了解问题（详细深入）

- What is the transport share of of total emissions?
  交通产生的排放比例
- What sub-sectors or vehicles are the main emitters
  主要排放源是什么（如：道路/铁路；柴油/汽油等 ）
- How do other cities perform?
  各城市之间 如何协作

Support leaders in deciding on measures
帮助决策者研究解决措施

- Analysing impact of measures (e.g. Subway) ex-ante e.g. for climate action plans
  分析措施影响 （如地铁）
- Developing scenarios and emission reduction potential for transport plans
  交通规划中的情景和减排潜力发展

Emission Accounting
排放计算

Monitor goal achievement and impact
成果目标和政策效果监测

- Tracking emissions and achievement of political goals
  跟踪政治目标范围内的排放和政策成果
- Analysing the impact of measures ex post
  实施后，分析政策效果

Access to support and funding
资助获取

- Being eligible for national programmes (e.g. low carbon transport cities)
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监测当地或区域空气质量

Modelling local and regional air quality

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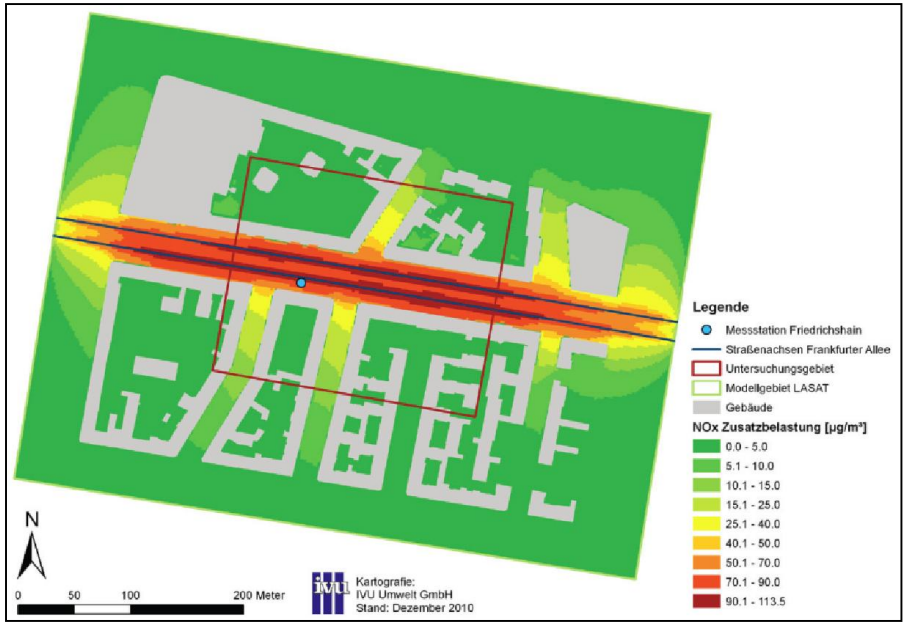
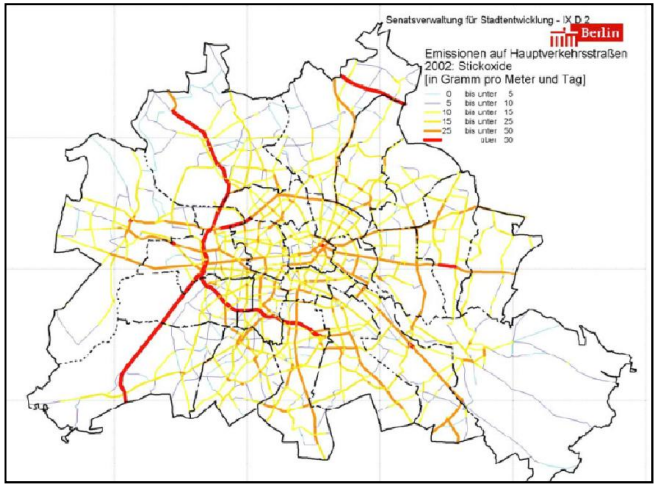
Street level (e.g. Frankfurter Allee in Berlin)

道路层面（如柏林的法兰克福大道）

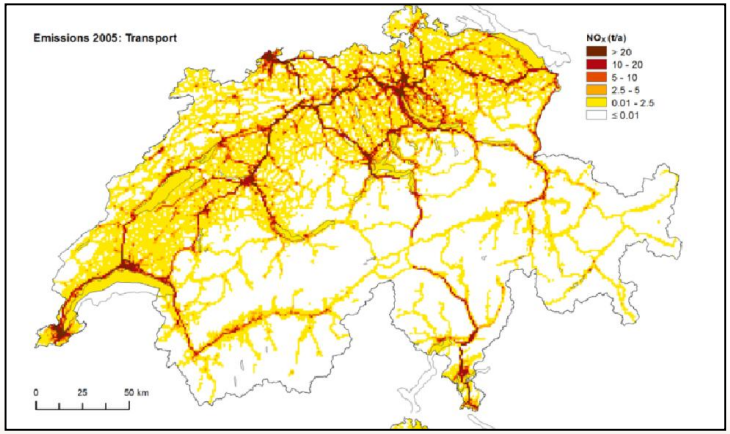


City level (e.g. Berlin)

城市层面（如柏林）

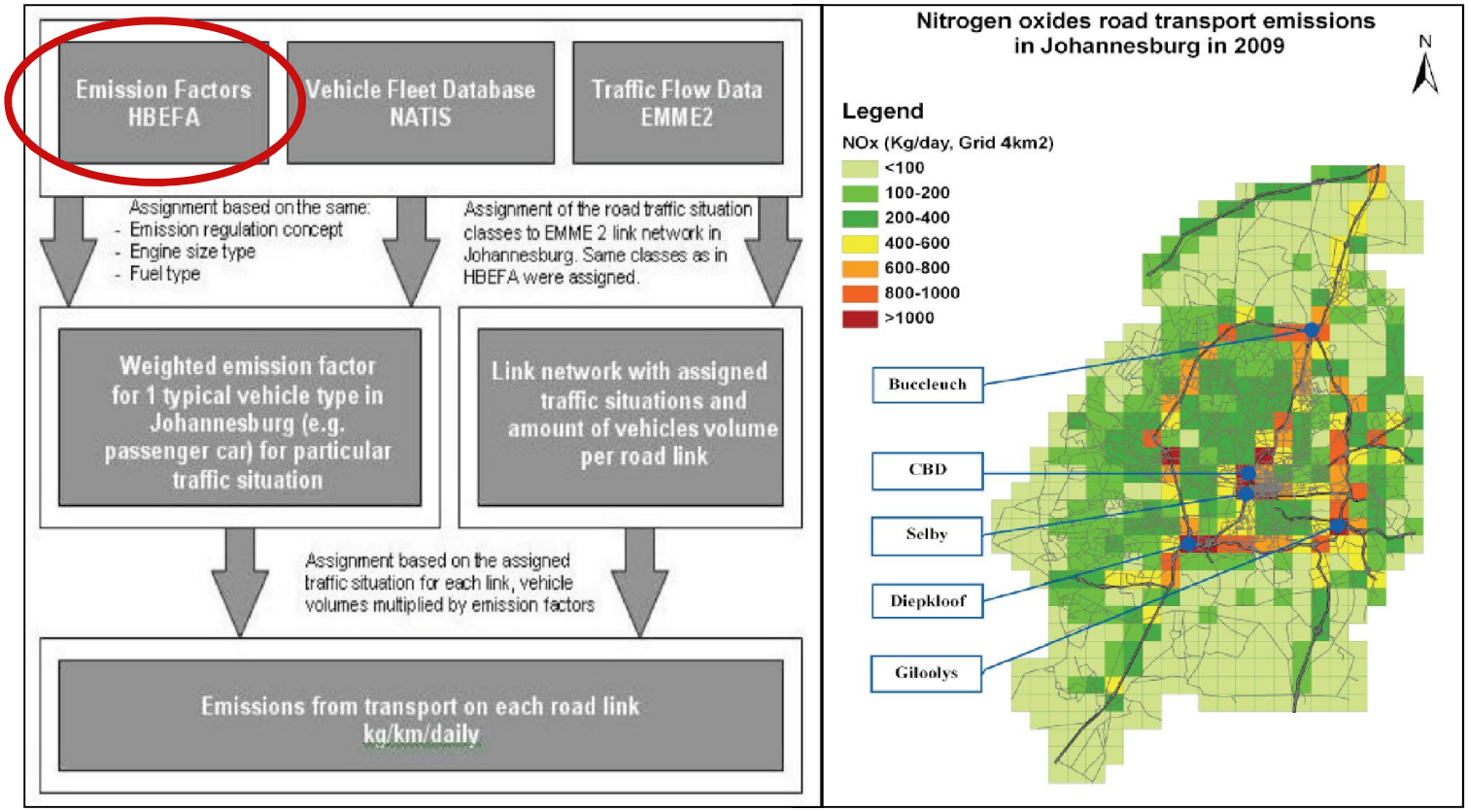


国家层面如瑞士 **National level**



➔ 不同工具使用**HBEFA**排放因子数据库

NO_x emission calculation of Johannesburg (South Africa)
南非约翰内斯堡氮氧化物排放计算举例



深圳的实时排放计算

Real-time emission calculation in Shenzhen

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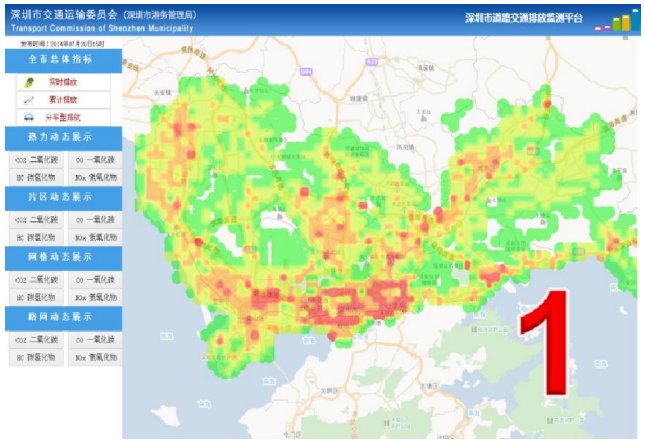
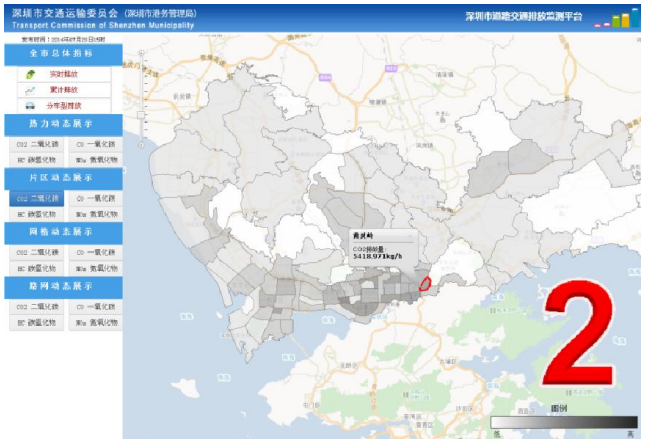
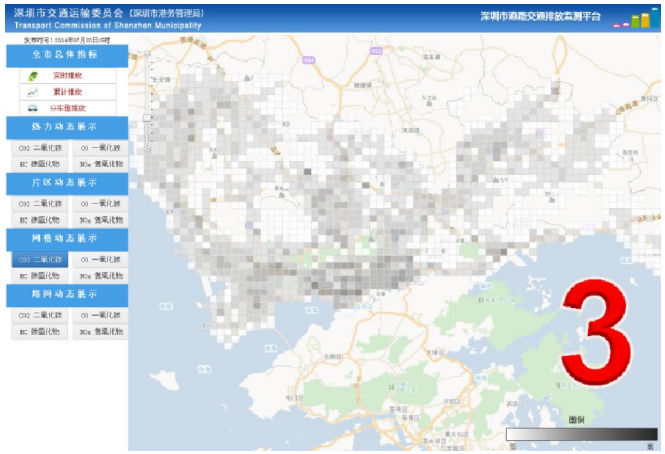
4种专题图形展示



热力图动态展示：形象表达全市范围交通排放强度分布



片区动态展示：定量查询全市各中区交通排放



网格动态展示：发布全市4000个同等面积网格交通排放定量数据

路网动态展示：发布全市范围道路交通排放，并提供定向查询功能

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城市交通气候保护计划
Urban Transport Climate Change Action Plans

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London
伦敦
22%, 2006

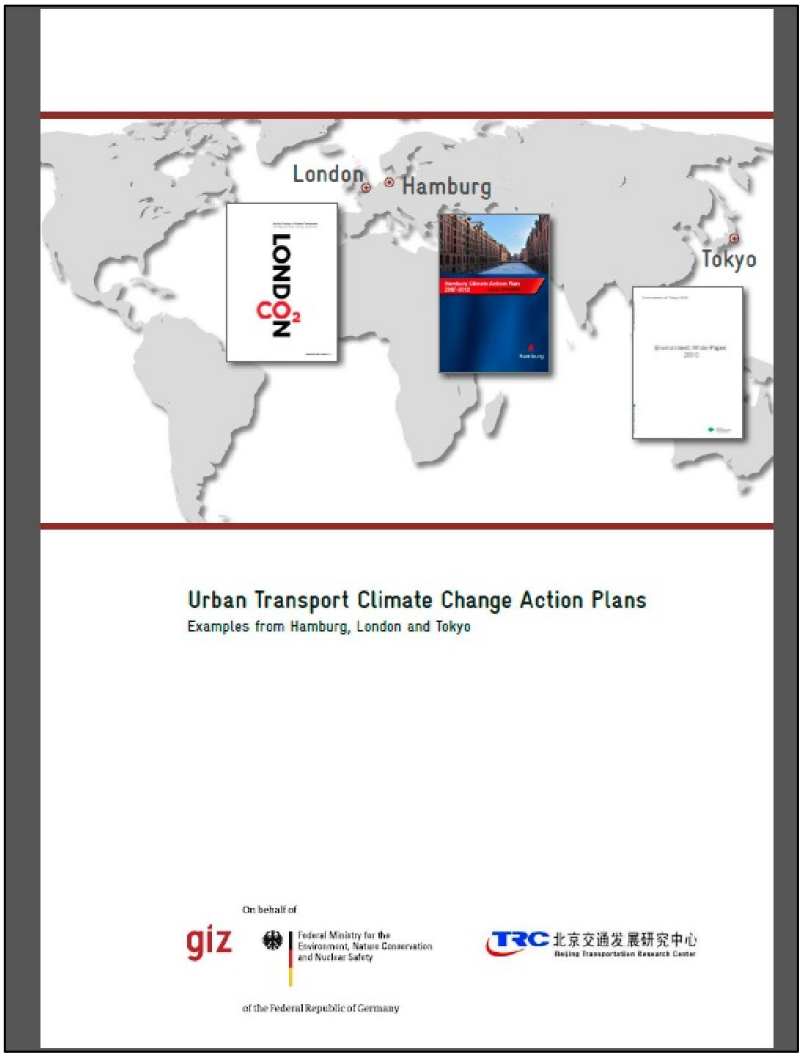
60% GHG emission reductions
from 1990 to 2025
从1990年到年
温室气体排放将减少60%

Hamburg
汉堡
25%, 2007

80% GHG emission reductions
from 1990 – 2050
从1990年到2050年
温室气体排放降低80%

Tokyo
东京
26%, 2005

40% GHG emission reductions
from 2000 to 2020
从2000年到2020年
温室气体排放将减少40%



Integrated transport planning in Berlin
柏林综合交通规划

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The Integrated Transport Master Plan
综合交通总体计划 (STEP)

Analyses and Forecasts 分析和预测

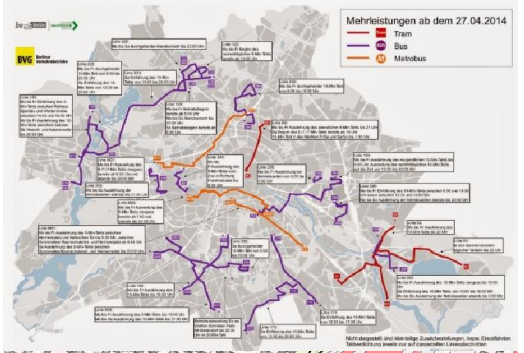
Guiding Vision 指导愿景
(integrated 综合性)

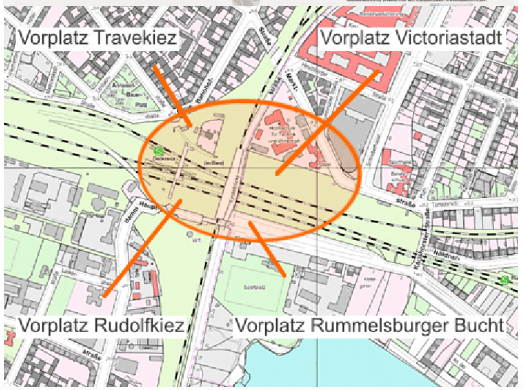
Strategy 战略
(7 partial strategies, 7个子战略)

Aims 目标
(12 quality Aims, 4 dimen-sions;
12项质量目标，4个维度)

Impact Assessment 影响评估和评价

Measures 措施
(5 different categories 5种类型)





Good implementation requires data
有效的实施需要数据的支持

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Good implementation requires:
有效的实施需要：

Knowledge about the current situation 对现状的了解

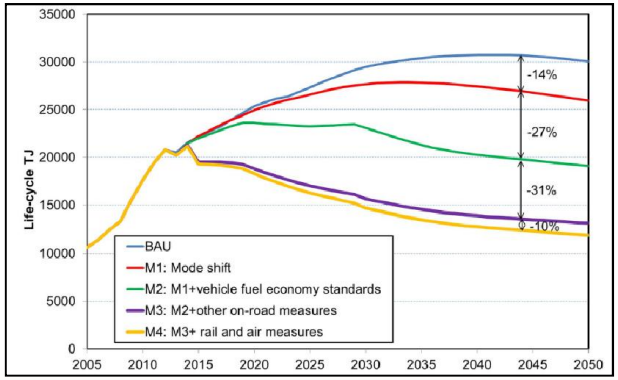
→ **Baseline modeling 基准模型**

Knowledge about the effects of measures 对实施效果的了解

→ **Scenario modeling 情景模拟**

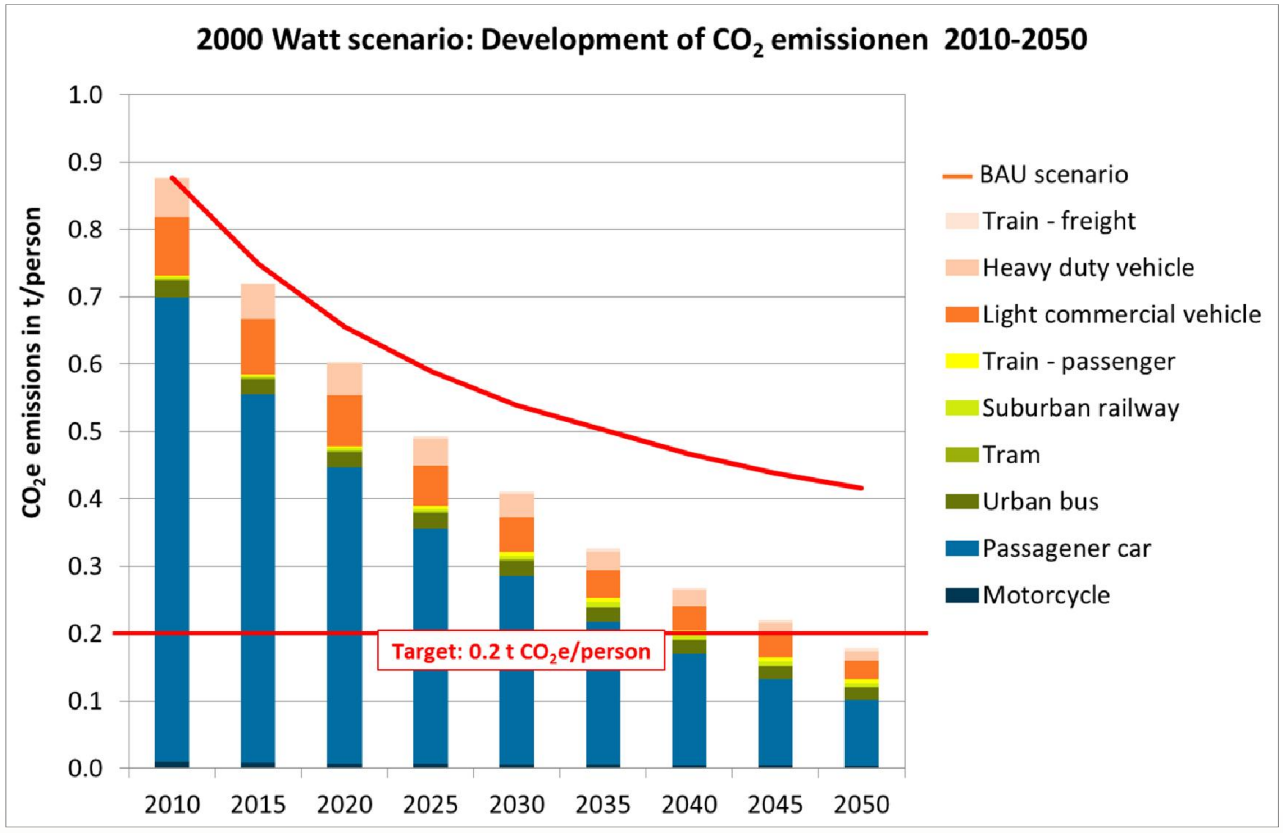
Vehicle activity survey

age	segment	number of cars		Specific annual mileage		Annual VKT sum
0 years	<1.4L	27	x	16'000	=	432'000
	1.4-2.0L	81	x	20'000	=	1'620'000
	>2.0L	18	x	24'000	=	432'000
1 years	<1.4L	28	x	14'400	=	403'200
	1.4-2.0L	67	x	18'000	=	1'206'000
	>2.0L	17	x	21'600	=	367'200
2 years	<1.4L	33	x	12'960	=	427'680
	1.4-2.0L	61	x	16'200	=	988'200
	>2.0L	16	x	19'440	=	311'040
3 years	<1.4L	39	x	11'664	=	454'896
	1.4-2.0L	49	x	14'580	=	714'420
	>2.0L	14	x	17'496	=	244'944



Scenario Modelling for Policies: 2000 Watt Society Zurich, Switzerland

- Target for 2050 (mandatory):
  - 2000 Watt per person = 1 t CO_2 per persons and year for all sectors
  - Transport sector (w/o air traffic): around 0.2 t CO_2 per persons



2000 Watt scenario = ambitious package of measures (e.g. mobility pricing, reduction of lanes on roads)

⇨ Impact analyses of measures with HBEFA

Scenario development of future emissions
未来排放的情景发展

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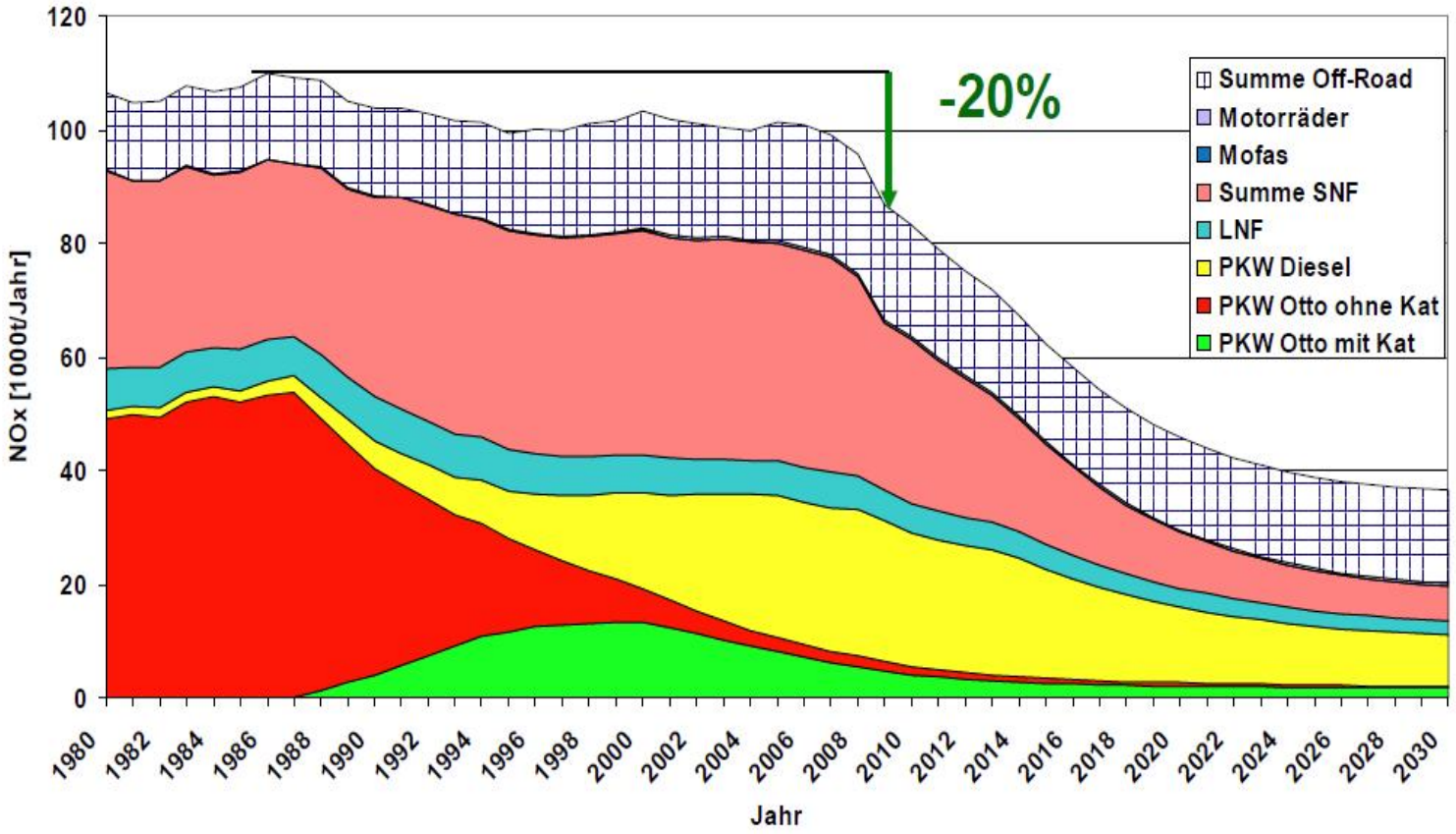
奥地利氮氧化物排放 NO_x emissions in Austria



* 由HBEFA计算 Calculated with HBEFA

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Stockholm's Congestion Charge
斯德哥尔摩拥堵费

Emission reductions* through congestion charging:
通过拥堵收费进行减排：

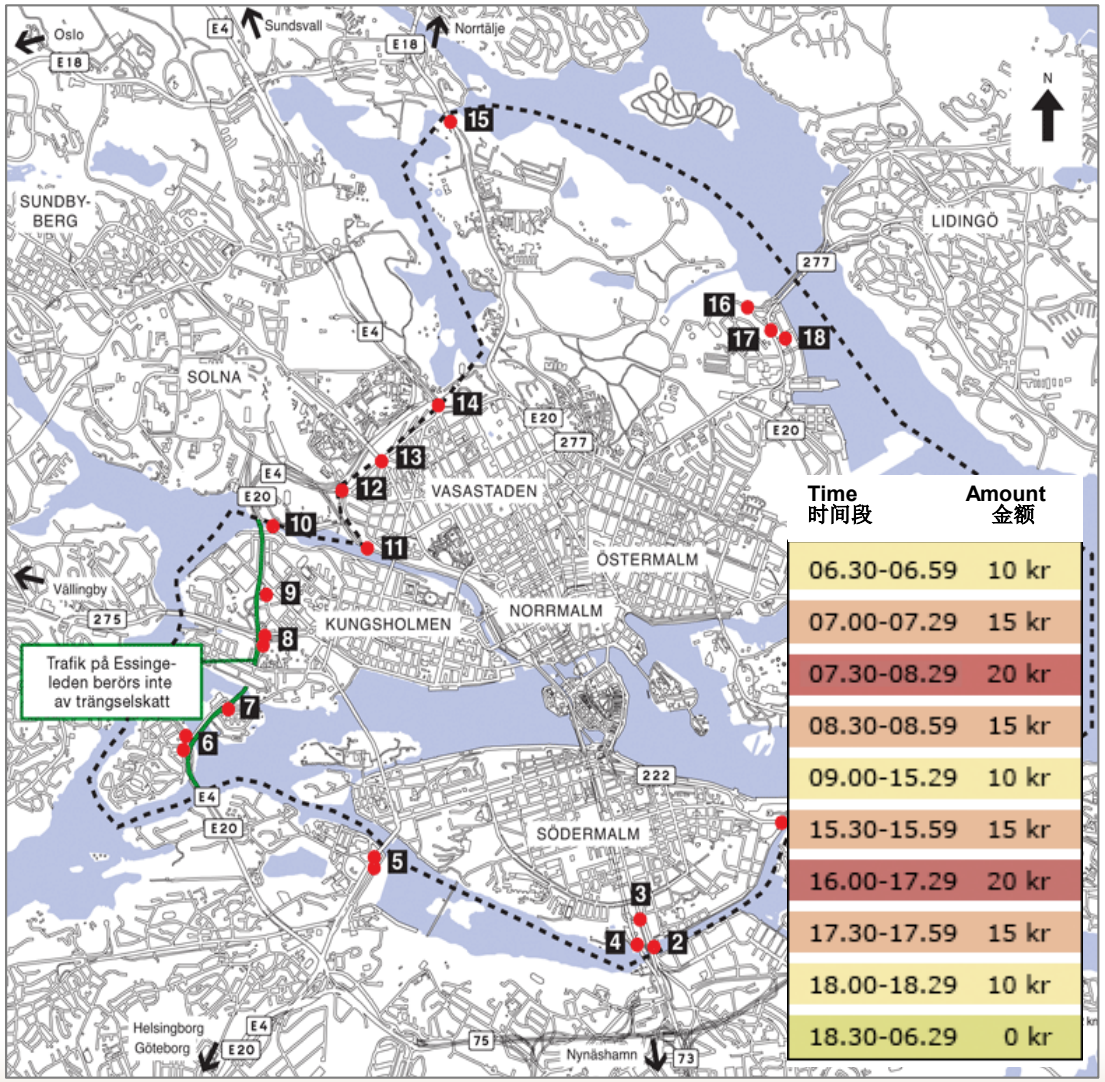
Inner city 市中心:

- NO_X: ↓ 8.5%
- Air-borne pollutants: ↓ 10-14%

Metropolitan area 大城市:

- CO_2: ↓ 2-3%

*Calculated with HBEFA Sweden
由瑞典HBEFA计算



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Assessing transport-related emissions
交通领域排放评估

各城市温室气体排放清单的基本考虑
Basic considerations for GHG emission inventories of cities

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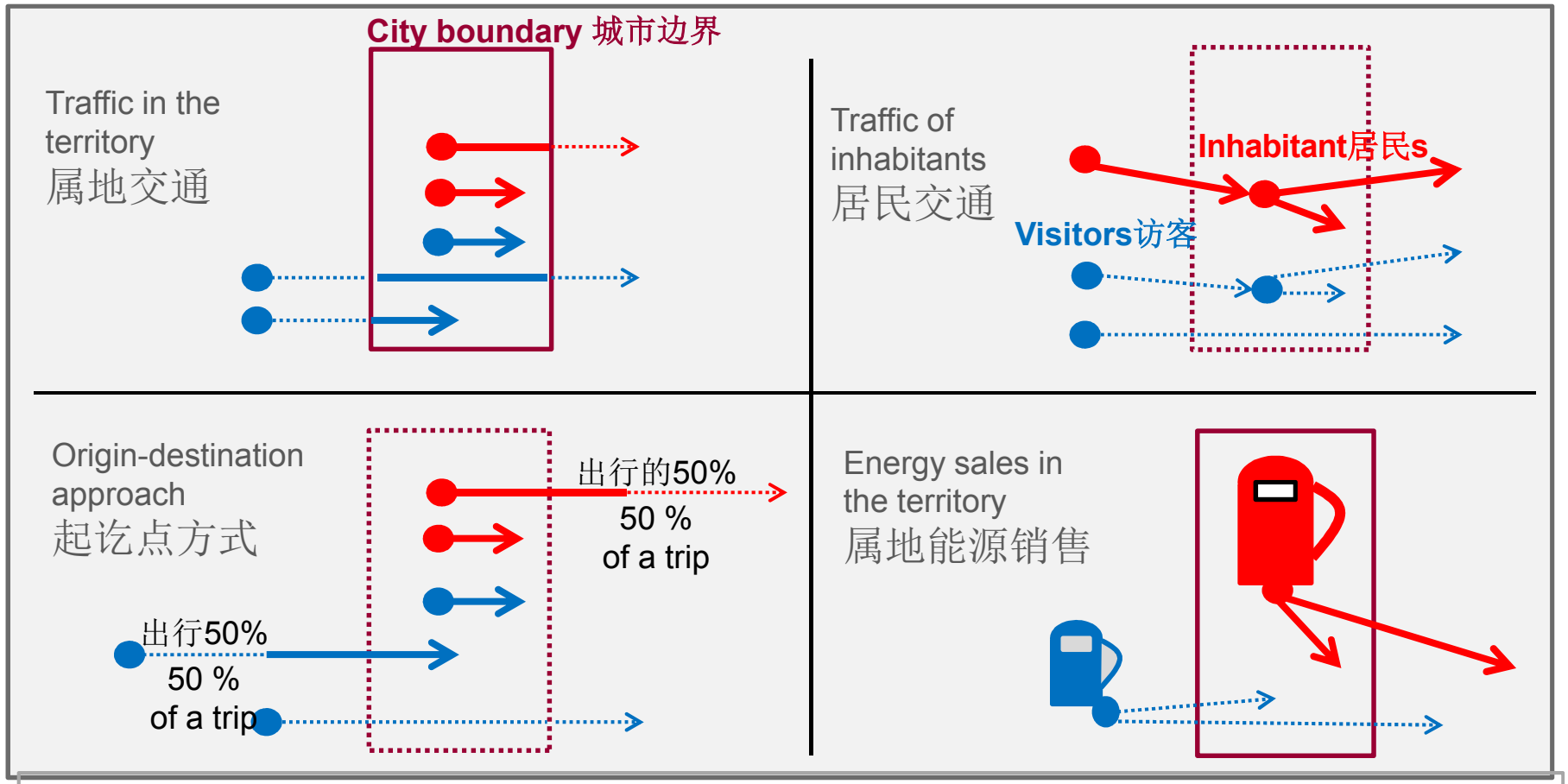
1. Which means of transport are considered in the quantfication?
   考虑哪些交通类型的排放量化？

2. Which transport activities are attributed to the city (system boundaries)?
   哪些交通活动归因于城市（系统界线）？

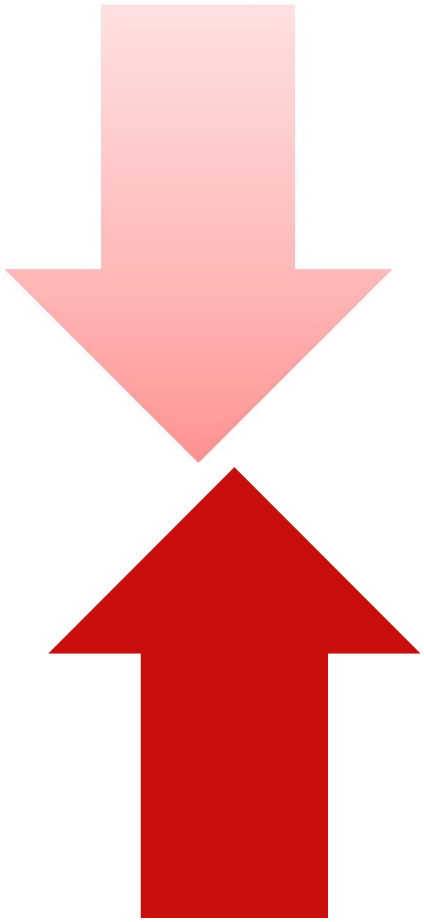
3. How are emission factors defined (CO_2 equivalents, upstream emissions)?
   如何定义排放因子（二氧化碳等同物，上游排放）？

➔Emission factor database included in CRTEM/HBEFA China
中国道路交通排放模型包含排放银子数据库

System boundaries 系统界线



Top-down vs bottom-up
自上而下方法和自下而上方法



Top-down 自上而下

Regional level data 区域水平数据

Energy based 基于能源

- Regional total energy consumption 区域总能耗
- Sales figures 销售数据
- Emissions per unit energy 每单位能源的排放
- Emission factors based on carbon content of fuel 基于碳含量的排放因子

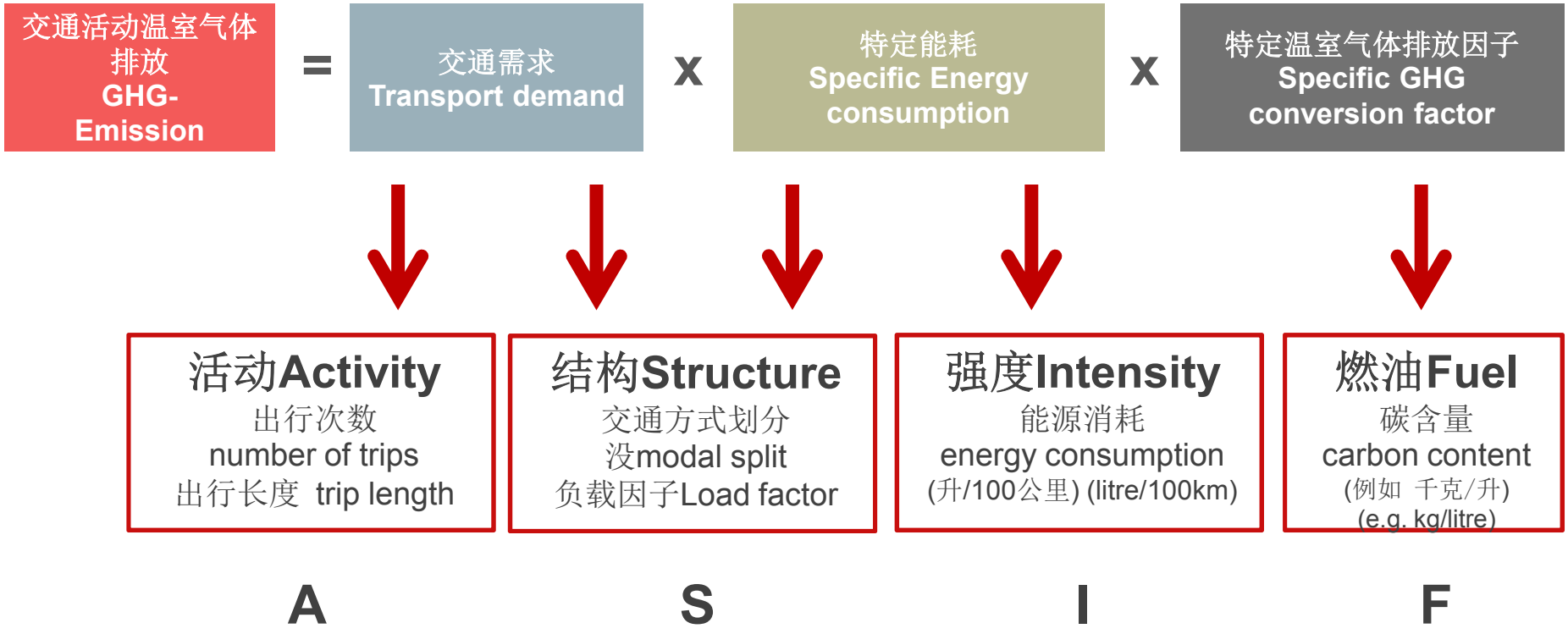
Bottom-up 自下而上

Data gathered from more detailed sources数据来源更精细化

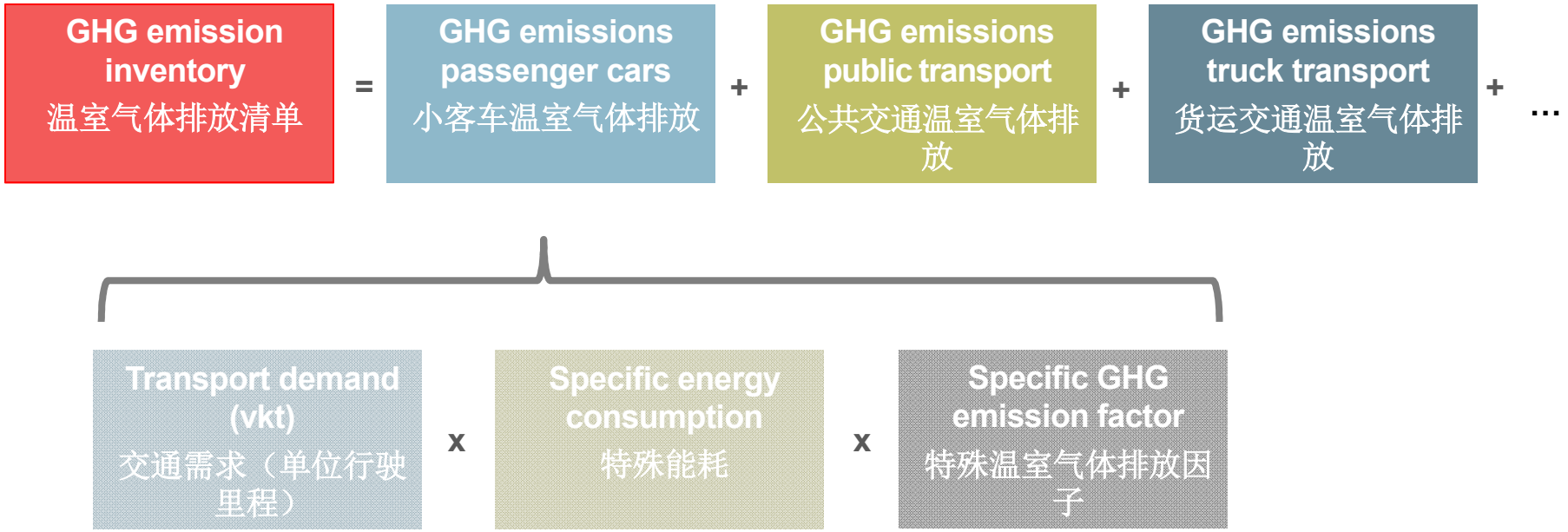
Activity based 基于活动

- Activity, e.g. total vkt 活动例如行车公里数
- Emissions per vkt 单位行驶里程的排放量
- Emission factors (g / activity unit)排放因子（克/单位活动）

Bottom-up calculation of transport emissions
交通排放自下而上的计算方法



考虑所有交通类型的数据收集
Collecting data for all means of transport considered



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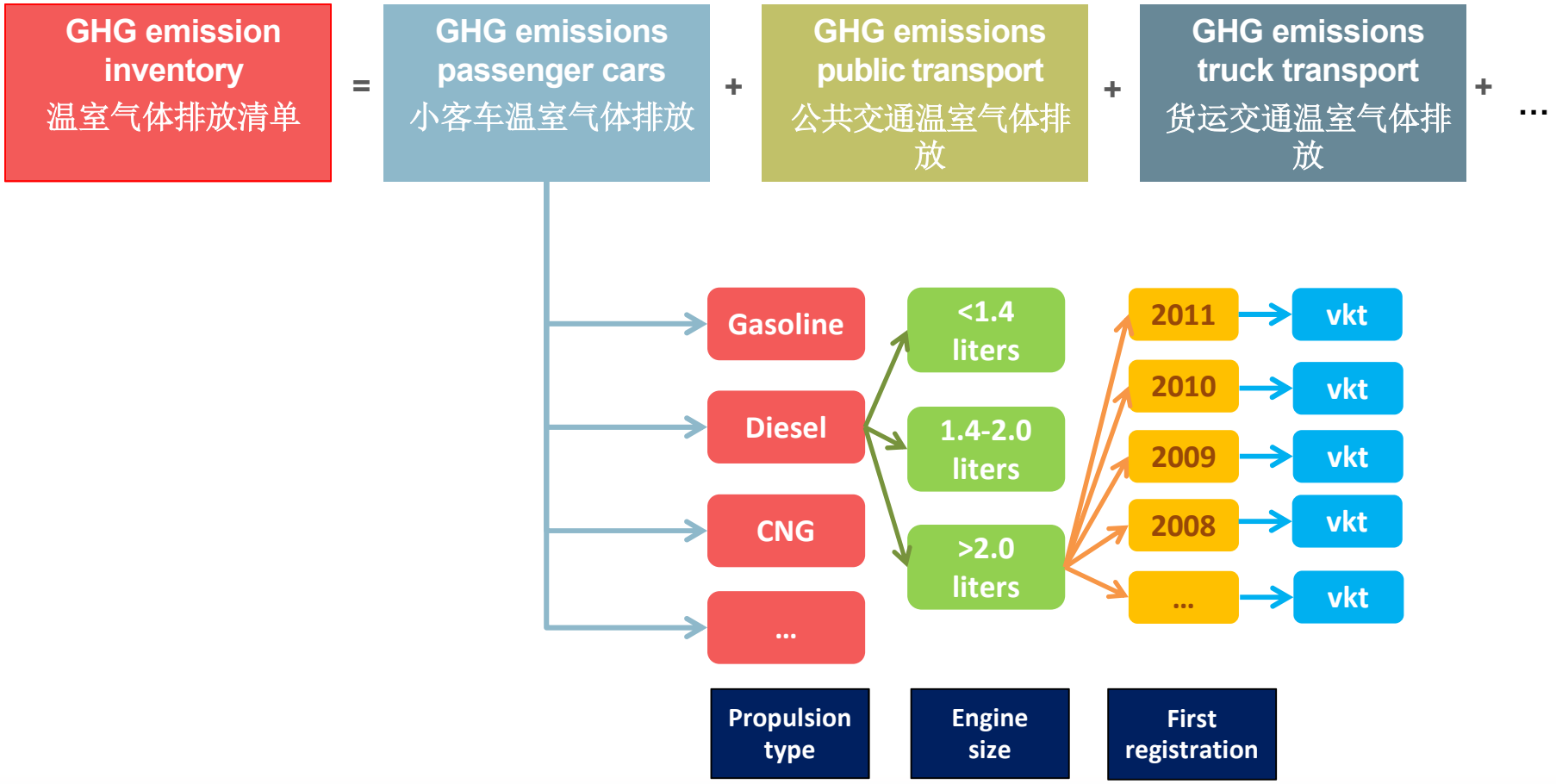

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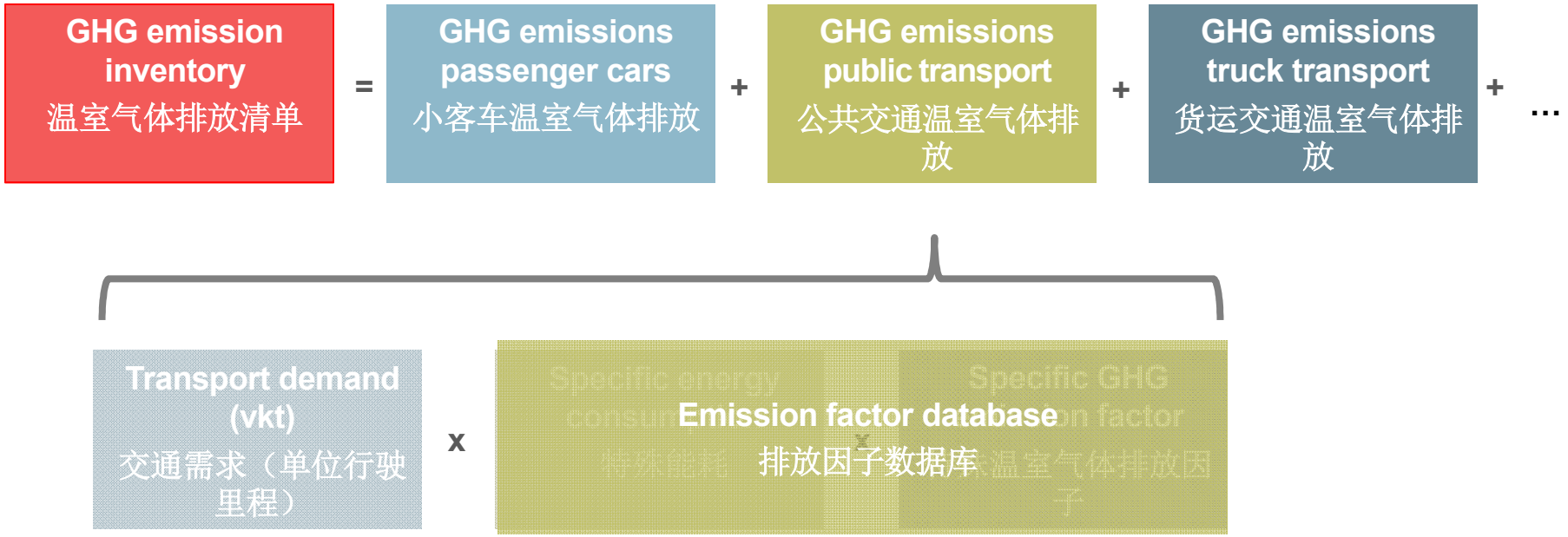
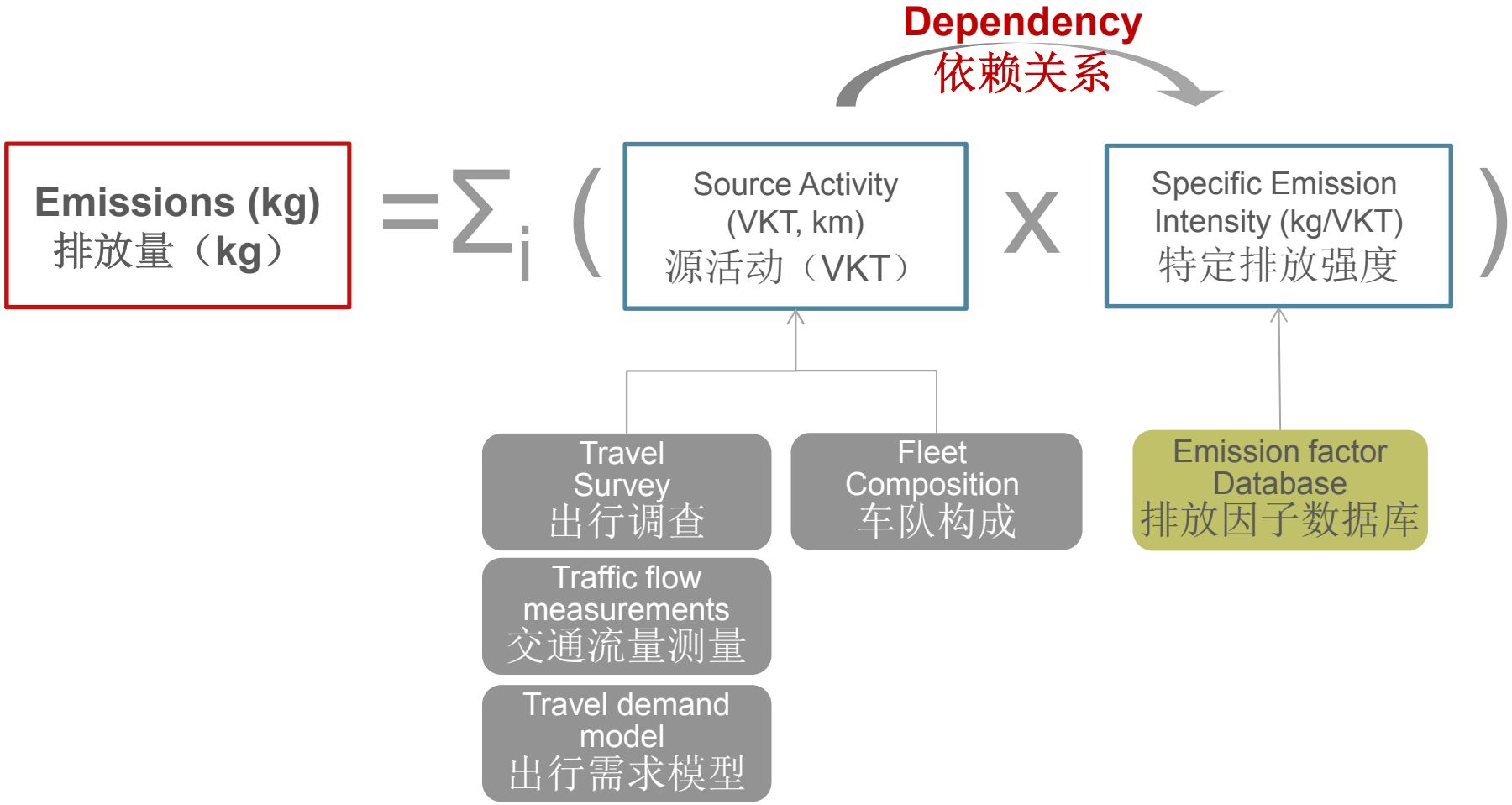


自下而上计算方法数据来源
Data sources for bottom-up calculations

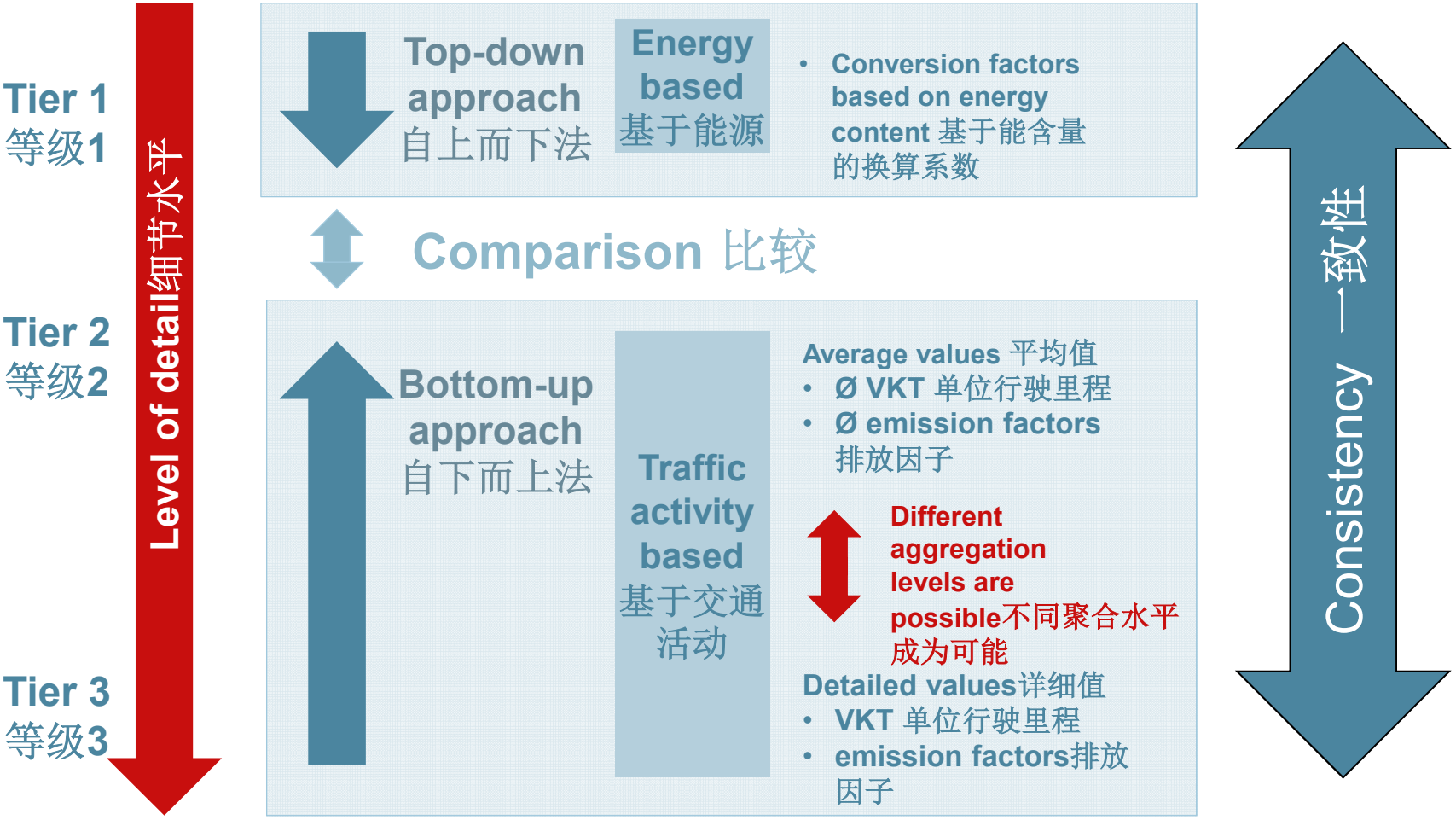


› Level A: At an aggregate level 水平A：总体水平

› Level B: At street level (By use of a transport model or traffic counts) 水平B：道路水平（通过使用交通模型或出行量计算）

温室气体量化的一致性

Consistency of GHG quantification



Data sources for transport activities
交通活动的数据源

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Transport activities rely highly on city-specific parameters (e.g. number of inhabitants, car ownership, transport infrastructure…) 交通活动高度依赖城市特点（如人口，小汽车保有量，交通基础设施状况等等）

→ Need for locally adapted transport activity data 对本地化的交通活动数据的需求

- City-specific data sources (e.g.): 特定城市的数据源（如）：
  - Local traffic census and driver surveys 本地交通普查和驾驶人员调查问卷
  - Urban travel demand models 城市出行需求模式
  - Data from national and federal traffic census 国家和省级层面交通普查数据
  - Mobility surveys 交通调查
  - Fuel sales statistics 燃油销售统计
  - Operating data of public transport companies 公共交通运营公司的运营数据
  - Official statistics of commuting traffic 通勤交通的官方统计

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Thank you for your attention!

谢谢关注！

Urda Eichhorst 云明慧

Project Manager 项目经理

Low Carbon Transport Development 低碳交通发展

urda.eichhorst@giz.de