

A systematic approach towards efficient logistics and green freight 实现高效物流与绿色货运的系统方法

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Content 内容

1. Key elements of a green freight strategy

绿色货运策略的关键因素

2. Exemplary options for greening freight transport

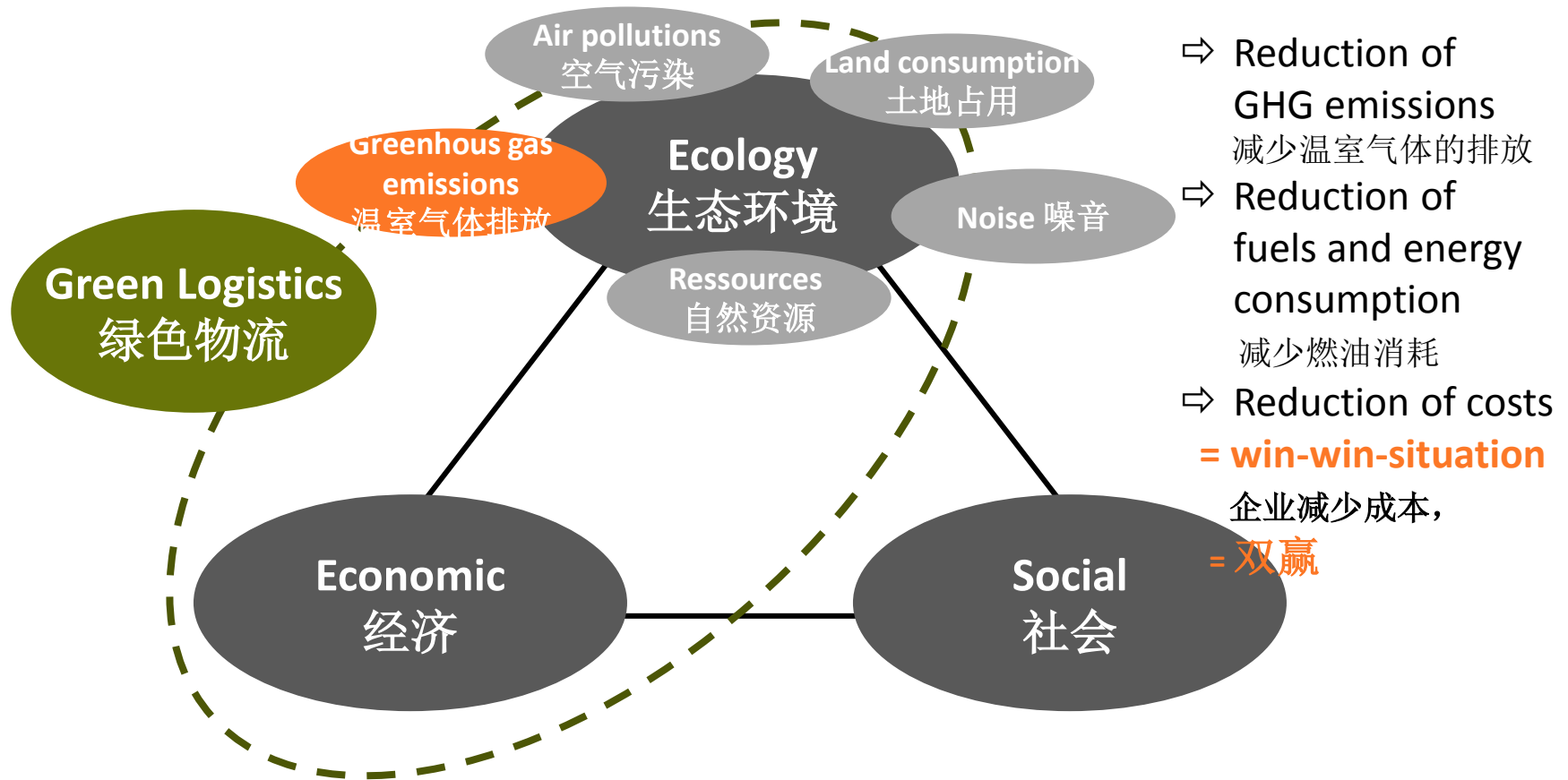
绿色货运措施示例

3. From options to a national action plan

从措施到国家行动计划

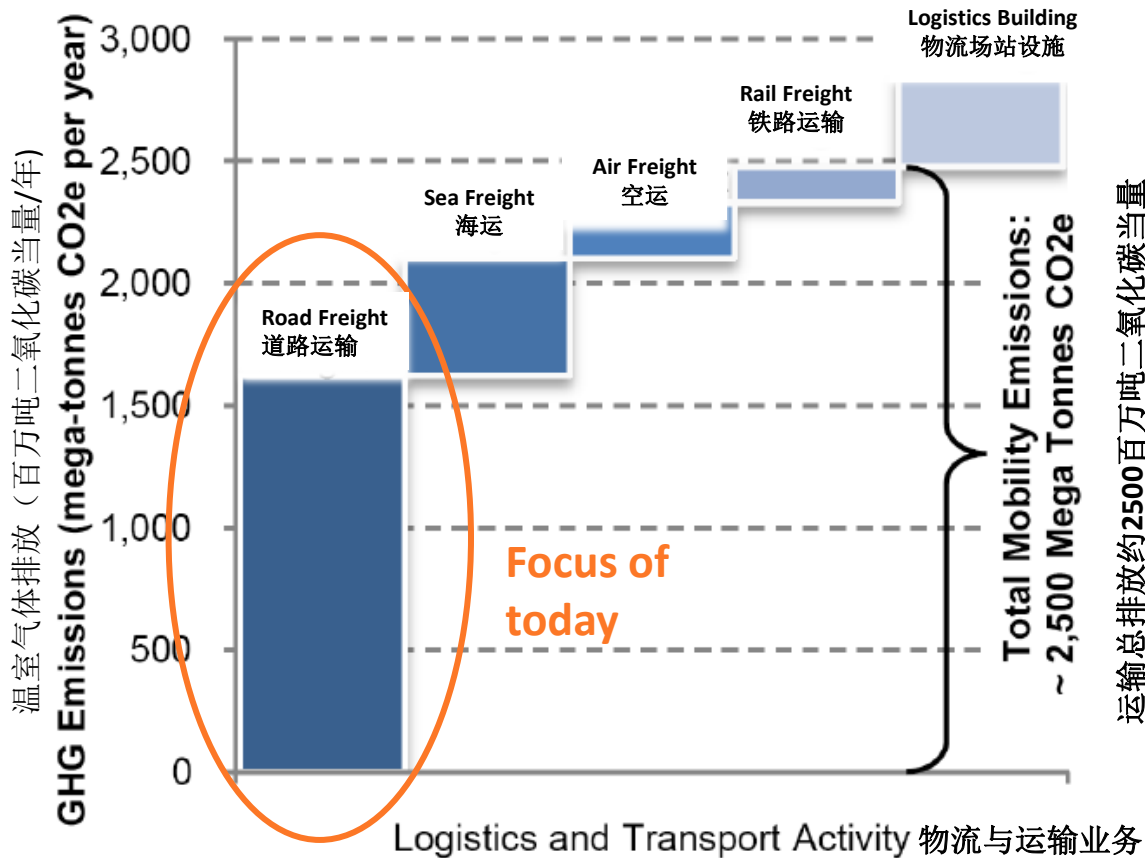
Green logistic in Europe focus on GHG emissions and costs to identify win-win-situations

欧洲绿色物流聚焦温室气体排放与成本以实现双赢



5-6% of the global direct greenhouse gas (GHG) emissions are caused by the logistic sector

全球5-6%的温室气体直接排放由物流行业产生



⇒ Logistic is more than the freight transport
物流不仅包含货物运输

⇒ a comprehensive green logistic strategy should address all topics

综合性的绿色物流策略应考虑所有涉及的要素

⇒ **BUT: particularly road transport is the dominating source for GHG emissions of logistic sector (also important for air pollutants and noise)**

但是：道路运输是物流业温室气体排放的主要源头（对空气污染及噪音亦同）

Source: World Economic Forum / Accenture, cited by McKinnon 2012.

来源：世界经济论坛/ Accenture, cited by McKinnon 2012

Starting point for a green freight strategy in road transport:

Calculation of GHG emissions

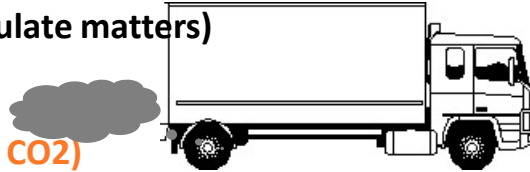
绿色道路货运战略的出发点：温室气体排放的计算

Air pollutants (e.g. NOX, particulate matters)

空气污染（氮氧化物、微颗粒物）

Greenhouse gas emissions (e.g. CO₂)

温室气体排放（如：二氧化碳）



Noise 噪音

land consumption

土地占用

GHG emission calculation and ... 温室气体排放的计算

CO₂ emissions 二氧化碳排放量 =

Weight of shipment x Distance x Specific CO₂ emission

货物重量

5吨

5 tons

x

运距

1000公里

1.000 km

x

排放因子

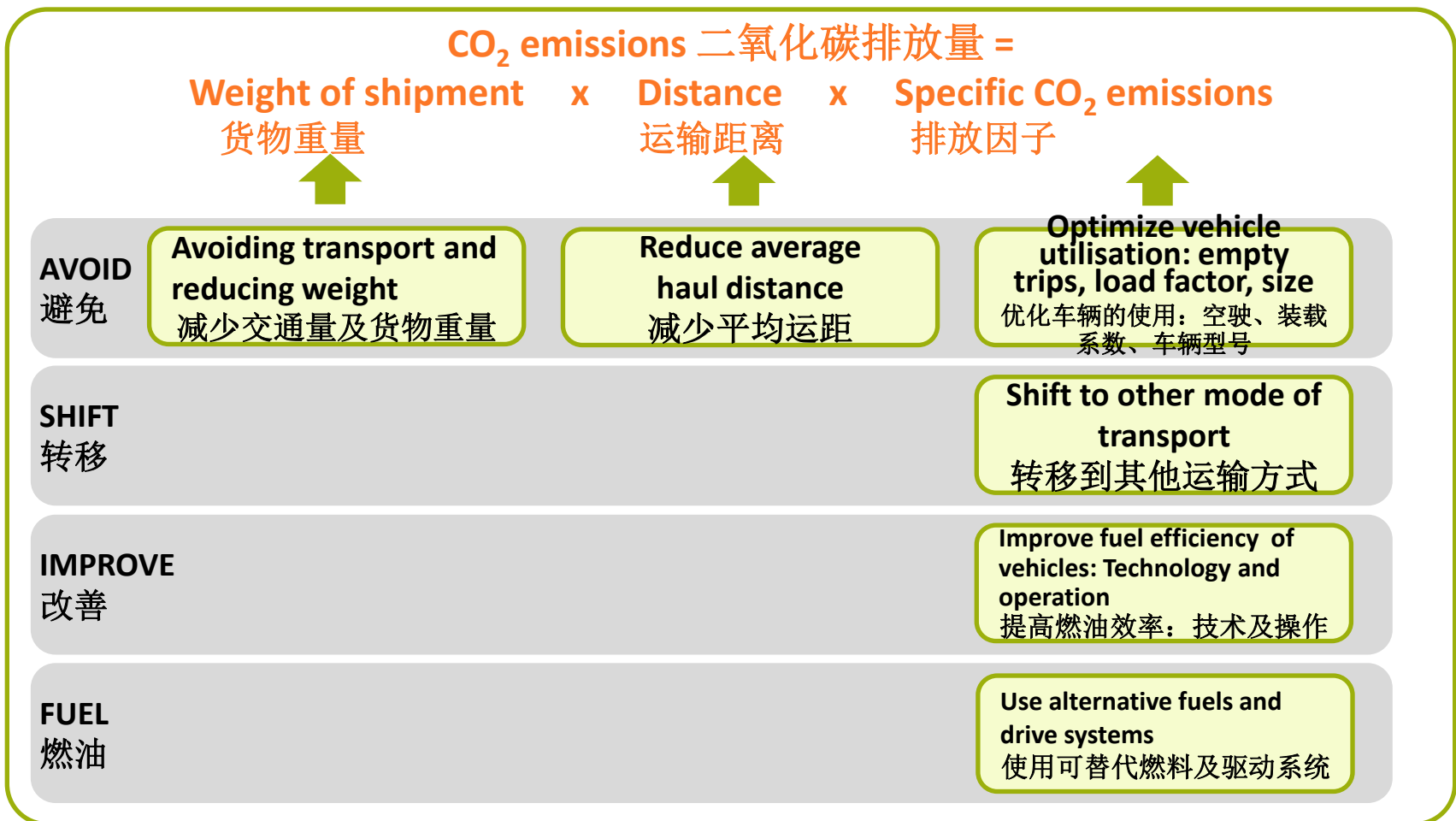
100克二氧化碳/吨公里

100 g CO₂ / tkm

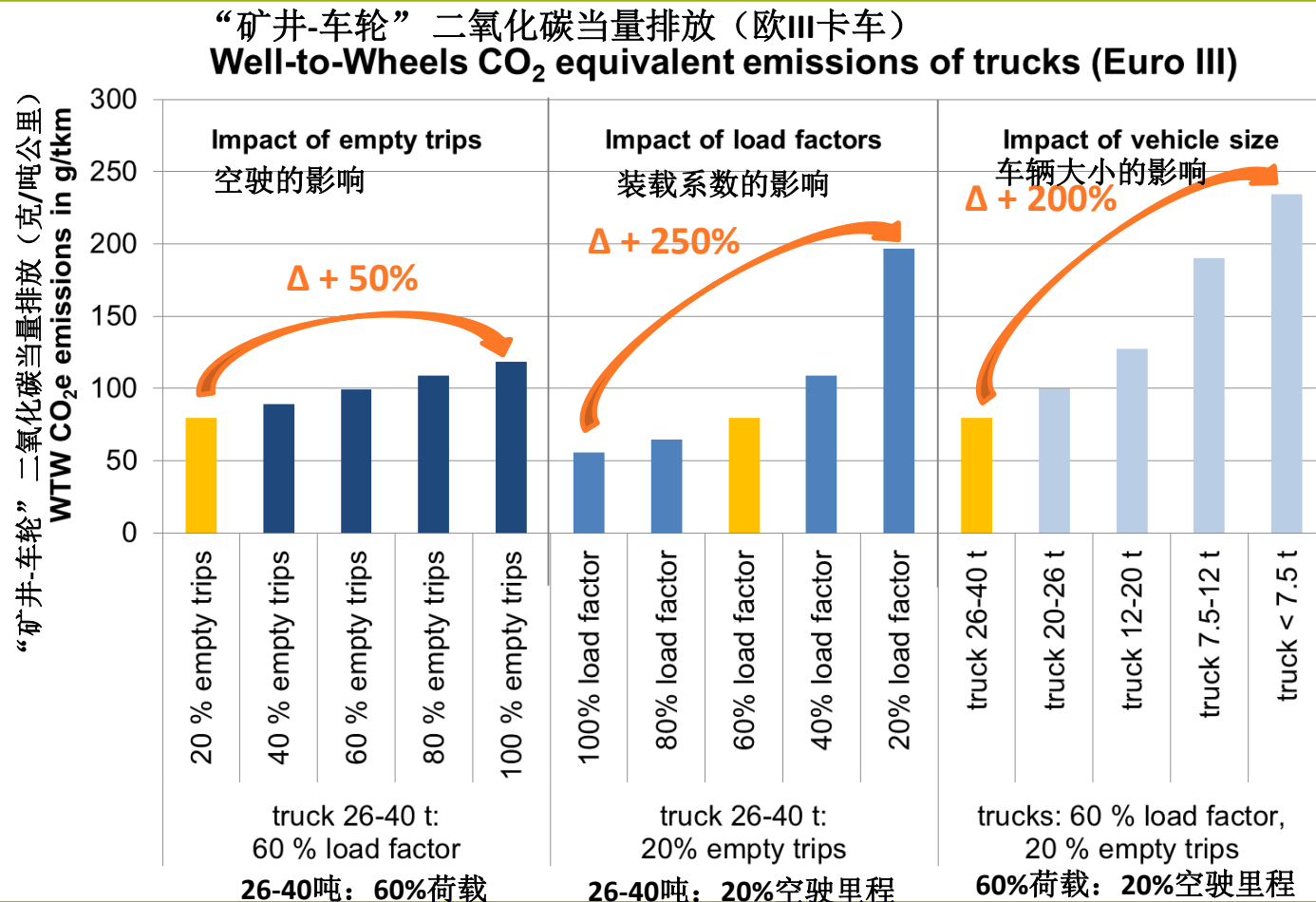
...potentials for GHG emission reductions 温室气体减排潜力

Possible options for greening the road freight transport: Overview

实现绿色道路货运的可选措施：概述



Impact of empty trips, load factor and vehicles size on GHG emissions of trucks 空驶、载荷系数及车辆大小对温室气体排放的影响

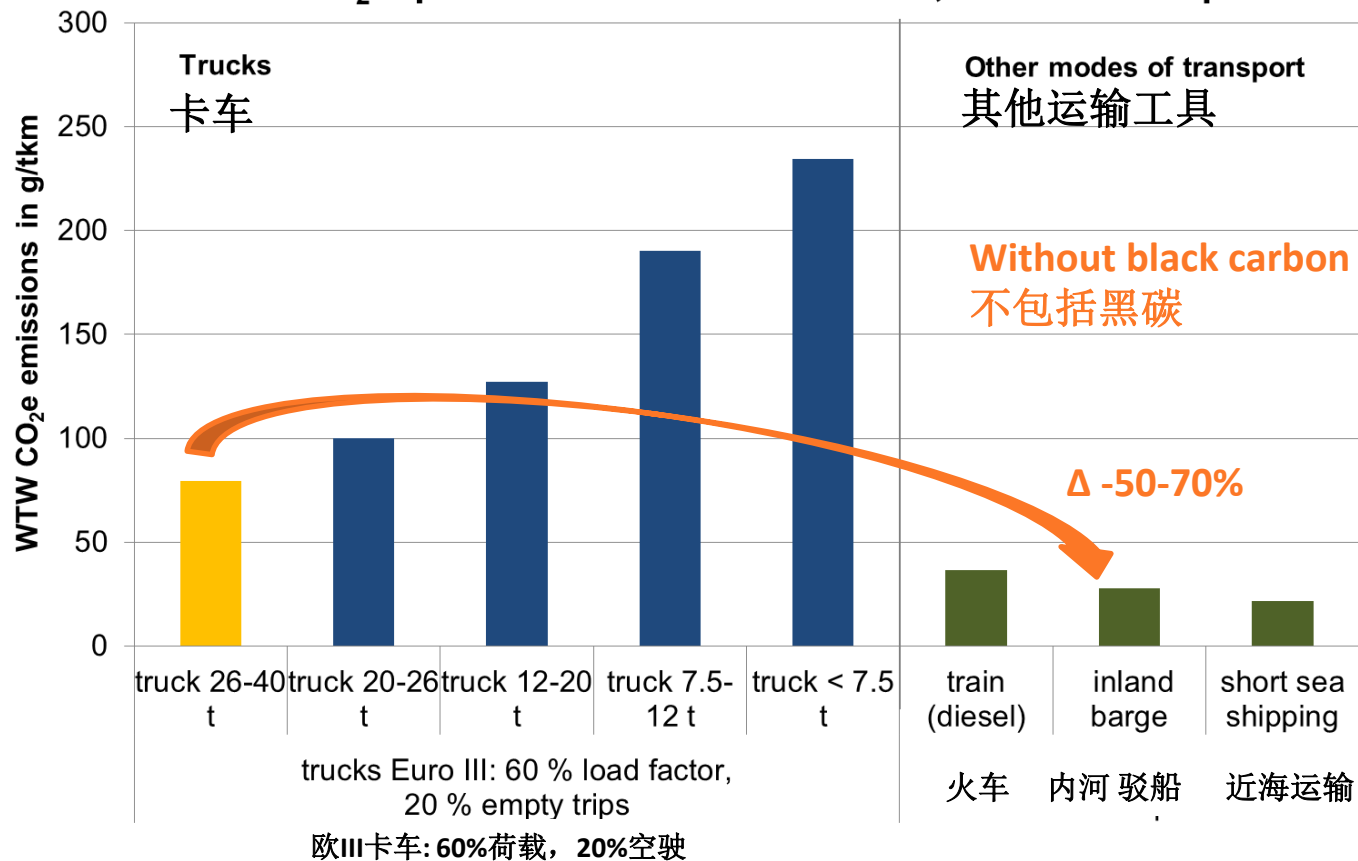


Impact of modes of transport on GHG emissions

各种运输工具温室气体排放

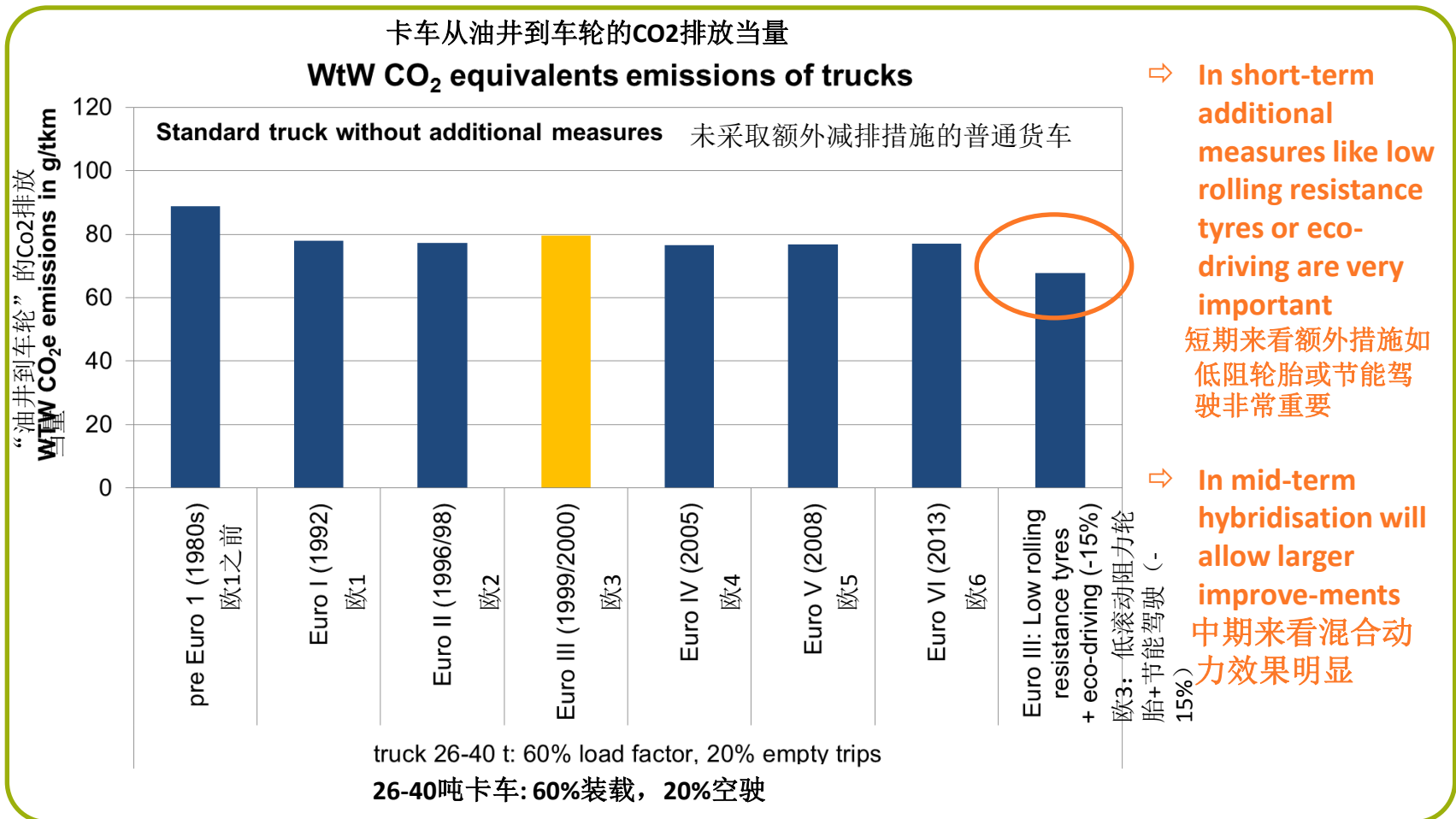
卡车、火车、轮船从油井到车轮的CO₂排放当量

WtW CO₂ equivalent emissions of trucks, trains and ships



Impact of new vehicles and additional measures on GHG emissions of trucks

新车及额外减排措施对卡车温室气体排放的影响

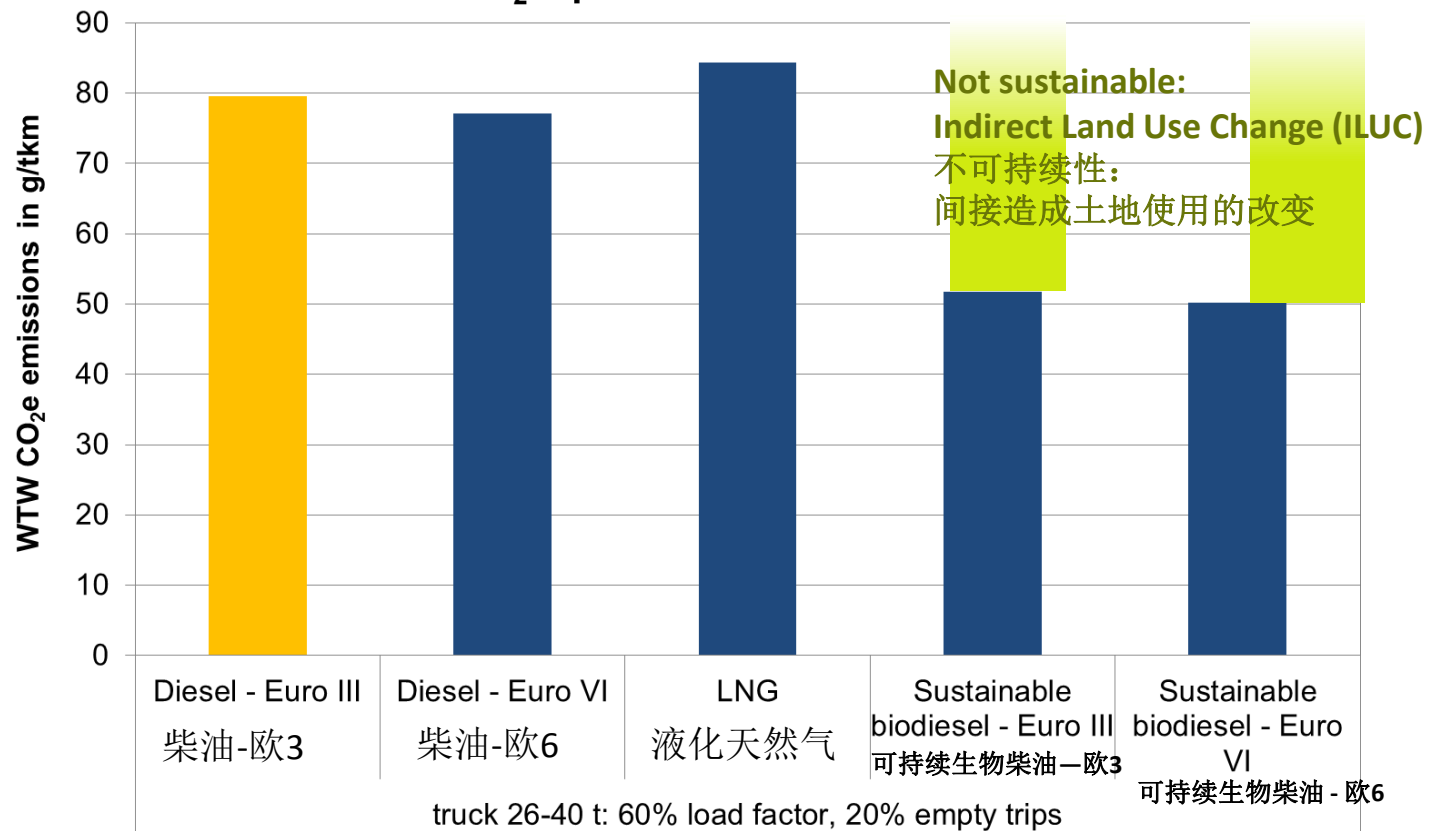


Impact of fuels used on GHG emissions of trucks

卡车燃油消耗对温室气体排放的影响

卡车从“油井到车轮”的CO₂排放当量

WtW CO₂ equivalent emissions of trucks



26-40吨卡车: 60%荷载, 20%空驶

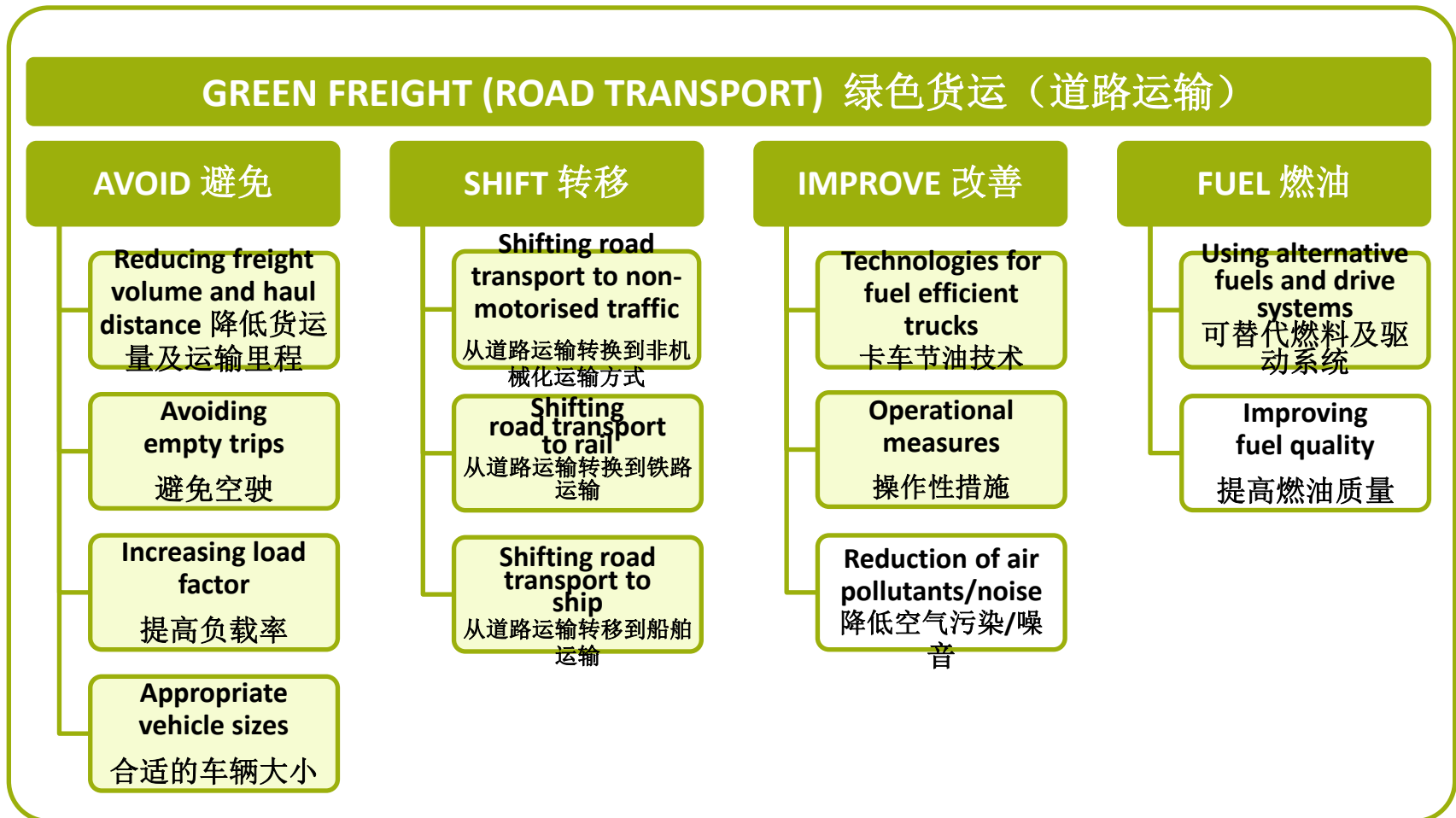
Source: Based on www.ecotransit.org, EN 16258.

| Approach towards efficient logistics and
green freight | 27th of April 2015 | Martin

Schmied

Key elements of a green freight strategy with focus on road transport

绿色货运策略中道路运输的关键因素



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Avoiding road freight transport by logistic optimization: Examples

通过优化物流解决方案避免运输：示例

AVOID 避免

Reducing freight volume and haul distance

减少货运量及运输距离

Avoiding empty trips

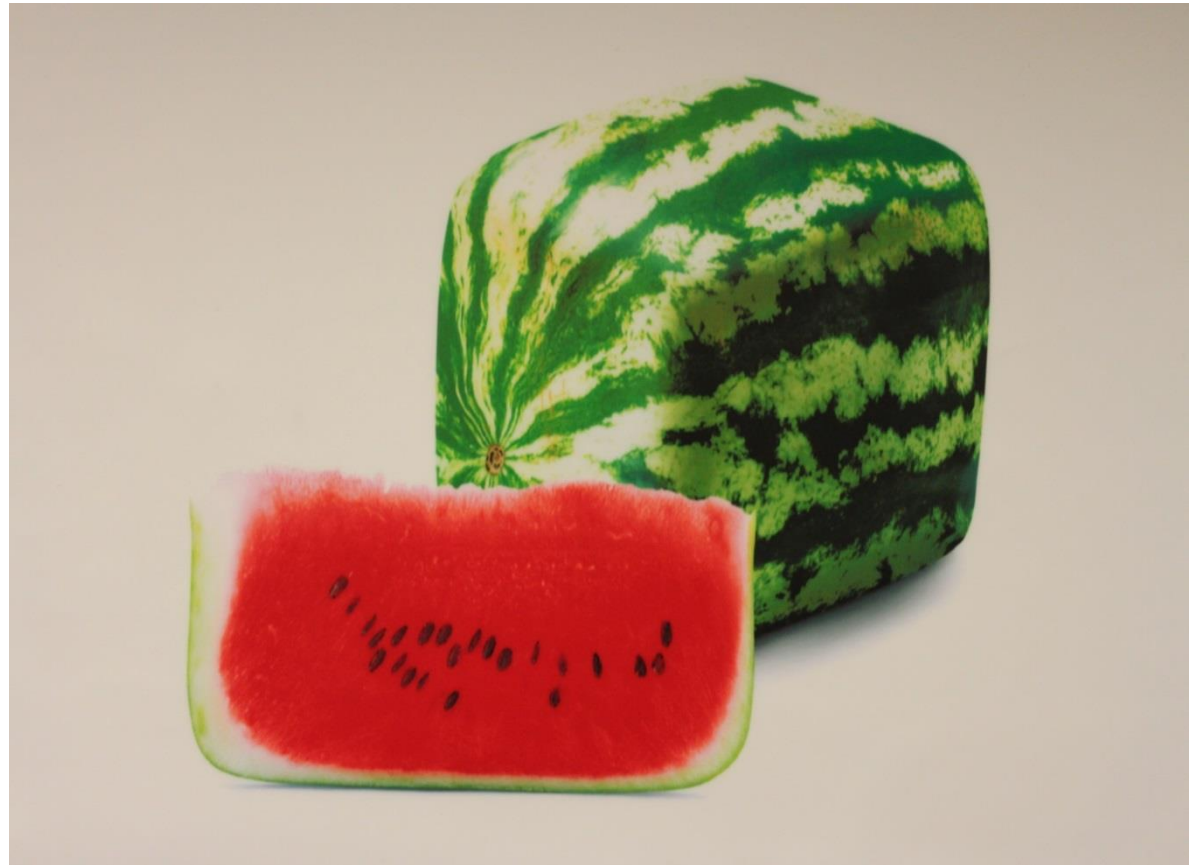
避免空驶

Increasing load factor

提高装载系数

Appropriate vehicle sizes

适宜的车辆大小



Reducing freight volume and haul distance: Innovative city logistic concept

减少运输量及运距：创新的城市物流方案

AVOID 避免

Reducing freight volume and haul distance

减少货运量及运输距离

Avoiding empty trips

避免空驶

Increasing load factor

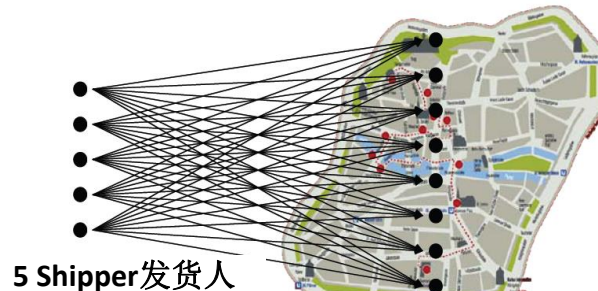
提高装载系数

Appropriate vehicle sizes

适宜的车辆大小

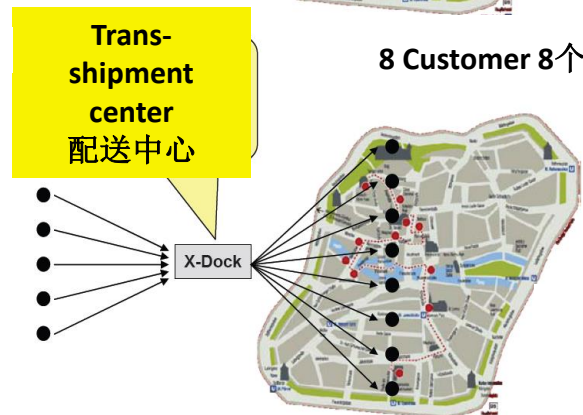
Pilot project in Nuremberg (Germany): Beverage logistics 德国纽伦堡市的试点项目：饮料配送物流

Today 当前



Direct supply 直接配送:
 $5 \times 8 = 40$ relationships
配送次数

Future 未来



⇒ Bundling effect reduce vehicle kilometres travelled by 32%!

Supply via x-Dock
通过配送中心配送:
 $5 + 8 = 13$ relationships
 $5 + 8 = 13$ 配送次数

Avoiding empty trips: Internet-based freight exchanges

避免空驶：基于互联网的货运信息交易平台

AVOID 避免

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Example of internet-based freight exchanges

互联网货运信息交易平台示例

Register my empty trailers

Looking for loads? We've always got them! Register your empty trailers here.

Route

Country of departure: *

From place: *

Country of destination: *

Valid from: *

at: 23 Feb. 2012

*Mandatory fields

Information about the equipment

Type of equipment: * Trailer

Specification: * Tilt trailer

My remarks:

Send

My workstation Registration of empty trailers

Ask for support Back

- **Similar measure: Corporate alliances for general cargo**
类似措施：零担货运联盟

Increasing load factor: Improvements by cooperation of shippers and logistic companies

通过货主及物流公司的合作提高装载系数:

AVOID 避免

Reducing freight volume and haul distance

减少货运量及运输距离

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适宜的车辆大小

Example: IKEA tea lights

示例:宜家的小蜡烛

- Tea lights are packed in boxes (not any more loosely in a bag)
装在盒子的小蜡烛（代替散装）
- Per pallet 3,600 instead of 2,500 tea lights could be transported (increase: more than 40%)
每个托盘能装3600个蜡烛，而不是2500（提高40%）
- Worldwide the transport of 18,000 pallets and 800 TEUs (Twenty-foot Equivalent Unit) could be avoided
全球减少1万8千个托盘和800个TEU标准箱的运输量
- that equates to a reduction of mileages by around 30% 等同于减少30%的运输里程
- similar approaches are realised by other companies (e.g. BSH Bosch und Siemens Hausgeräte GmbH) 在其他公司也有类似的方法（如博世.西门子家电公司）



Shifting road freight transport to more environmental-friendly modes: Examples

从道路货物运输转移到更环保的运输方式

SHIFT 转换

Shifting road transport to non-motorised traffic
转移到非机动车方式运输

Shifting road transport to rail
转移到铁路运输

Shifting road transport to ship
转移到船舶运输



Shifting road freight transport to rail: Need of new infrastructure (and funding)

从道路运输转移到铁路运输：对基础设施（及资金）的需求

SHIFT 转移

Shifting road transport to non-motorised traffic
转移到非机动车方式运输

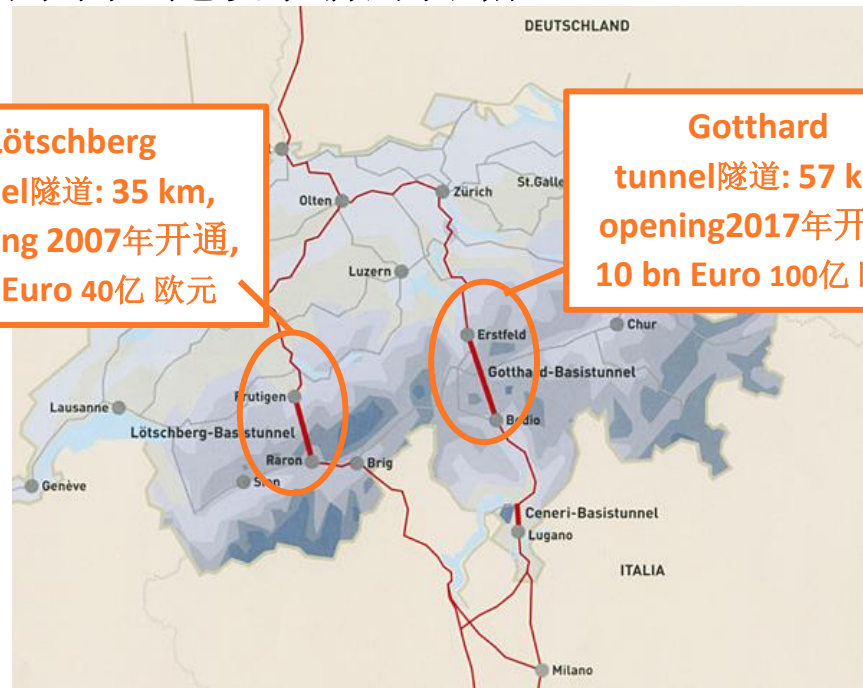
Shifting road transport to rail
转移到铁路运输

Shifting road transport to ship
转移到船舶运输

Example Switzerland: Construction of new railway tunnels 瑞士的示例：建设了新的铁路隧道

Lötschberg tunnel 隧道: 35 km,
opening 2007年开通,
4 bn Euro 40亿 欧元

Gotthard tunnel 隧道: 57 km,
opening 2017年开通,
10 bn Euro 100亿 欧元



⇒ Funding by introduction of a heavy duty vehicle charge
(based on popular vote)
向重型卡车收费来支持建设（基于全民公决）

Shifting road freight transport to rail: International harmonization needed

从道路转移到铁路运输：需要国际上的协调一致

SHIFT 转换

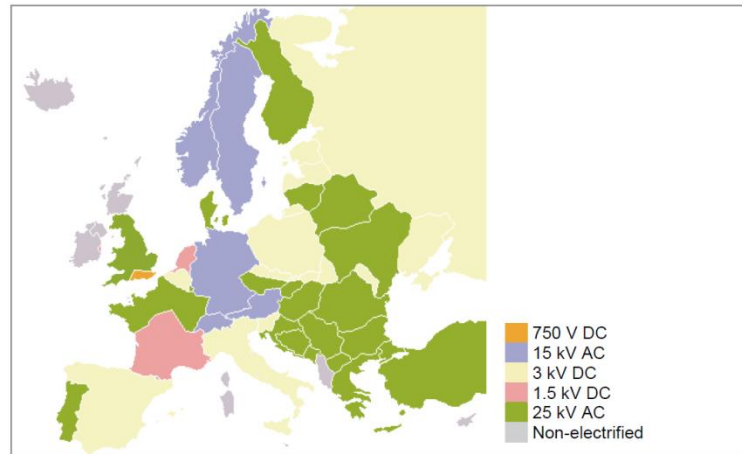
Shifting road transport to non-motorised traffic
转换到非机动车方式运输

Shifting road transport to rail
转换到铁路运输

Shifting road transport to ship
转换到船舶运输

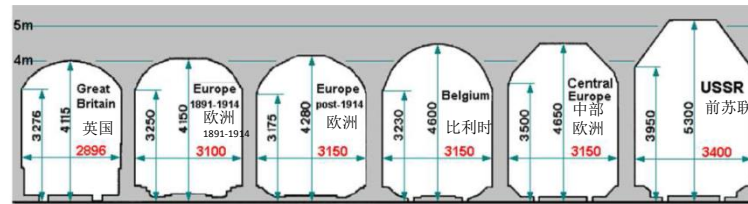
Example: Electrification systems across Europe

实例：欧洲的电气化系统



Example: Loading gauges in Europe

示例：欧洲铁路车厢的限高限宽



- ⇒ Loss of time if systems change
系统间的转换需要耗费时间
- ⇒ Need of special equipment (e.g. multi-current locomotives)
对特殊设备的需求（如多电流式机车）
- ⇒ International harmonization needed to speed-up the cross-order traffic
推动跨境交通需要国际上协调一致

Improving the fuel efficiency of trucks and reducing air pollutants and noise: Examples

提高卡车燃油效率，降低空气污染及噪音

IMPROVE 提高

Technologies for fuel efficient vehicles 提高卡车燃油效率的技术

Operational measures
可选择的措施

Reduction of air pollutants/noise
降低空气污染/噪音



Options to improve the fuel consumption of vehicles:

Improvements by different measures

提高燃油效率的各种措施

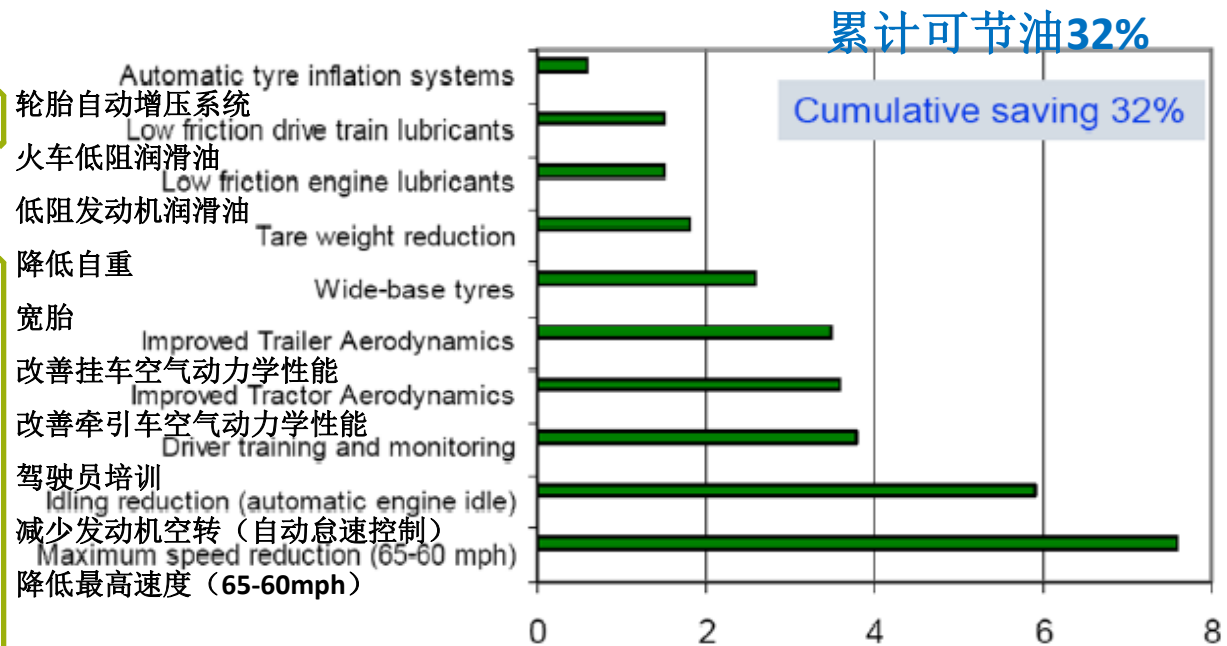
IMPROVE 提高

Technologies for
fuel efficient
vehicles 提高卡车
燃油效率的技术

Operational
measures
可选择的措施

Reduction of air
pollutants/noise
降低空气污染/噪音

**Percent savings in trucks' fuel use from several measures
(European situations): 几种措施的节油率对比**



Source: McKimmon, from Ang-Olson & Schroeder

Options to improve the fuel consumption of vehicles:

Improvements by technologies

提高车辆燃油效率的技术

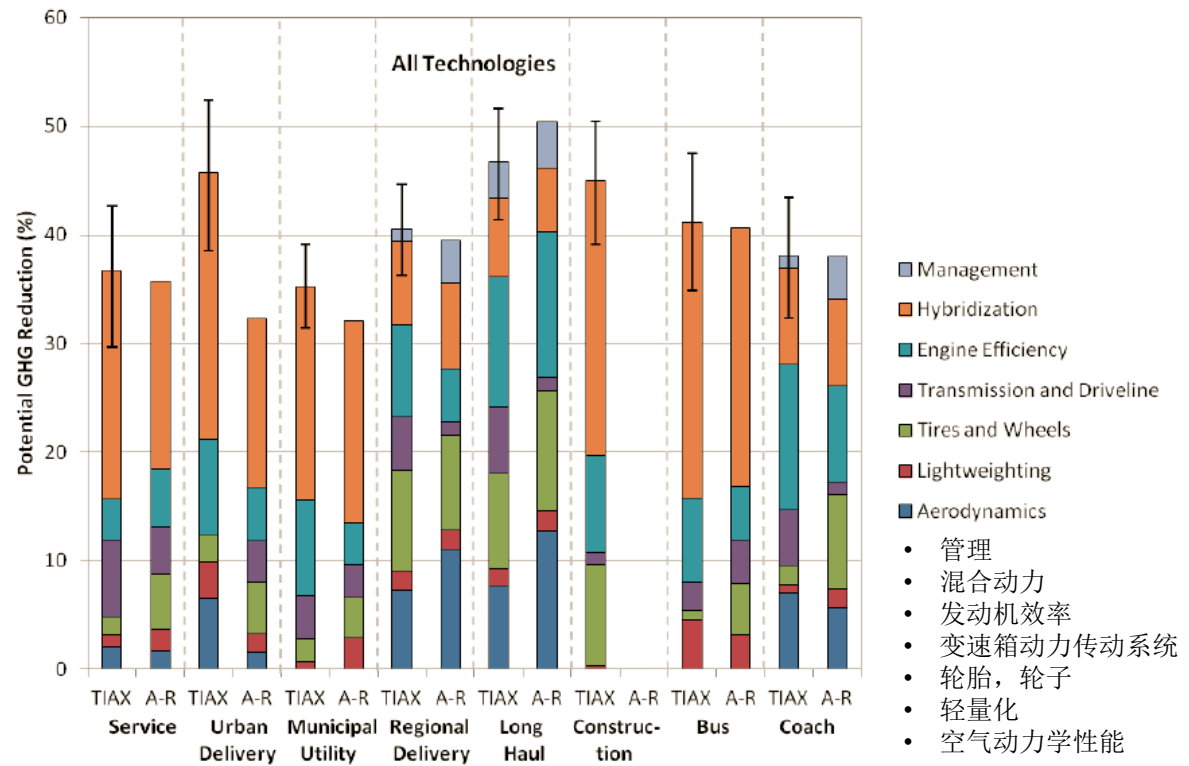
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Shifting road transport to non-motorised traffic
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Shifting road transport to rail
转移到铁路运输

Shifting road transport to ship
转移到船舶运输

GHG reductions potential of all technologies for new vehicles 新型车辆技术减排潜力



Source: ICCT 2011.

Using alternative fuels and drive systems: Examples

使用可替代性燃油及驱动系统

Fuel 燃油

Using alternative fuels
and drive systems

使用可替代燃油及驱
动系统

Improving
fuel quality
提高燃油质量



Using alternative fuels and drive systems: Biofuels have high environmental impacts (1)

使用可替代燃油及驱动系统：生物燃油对环境的影响（1）

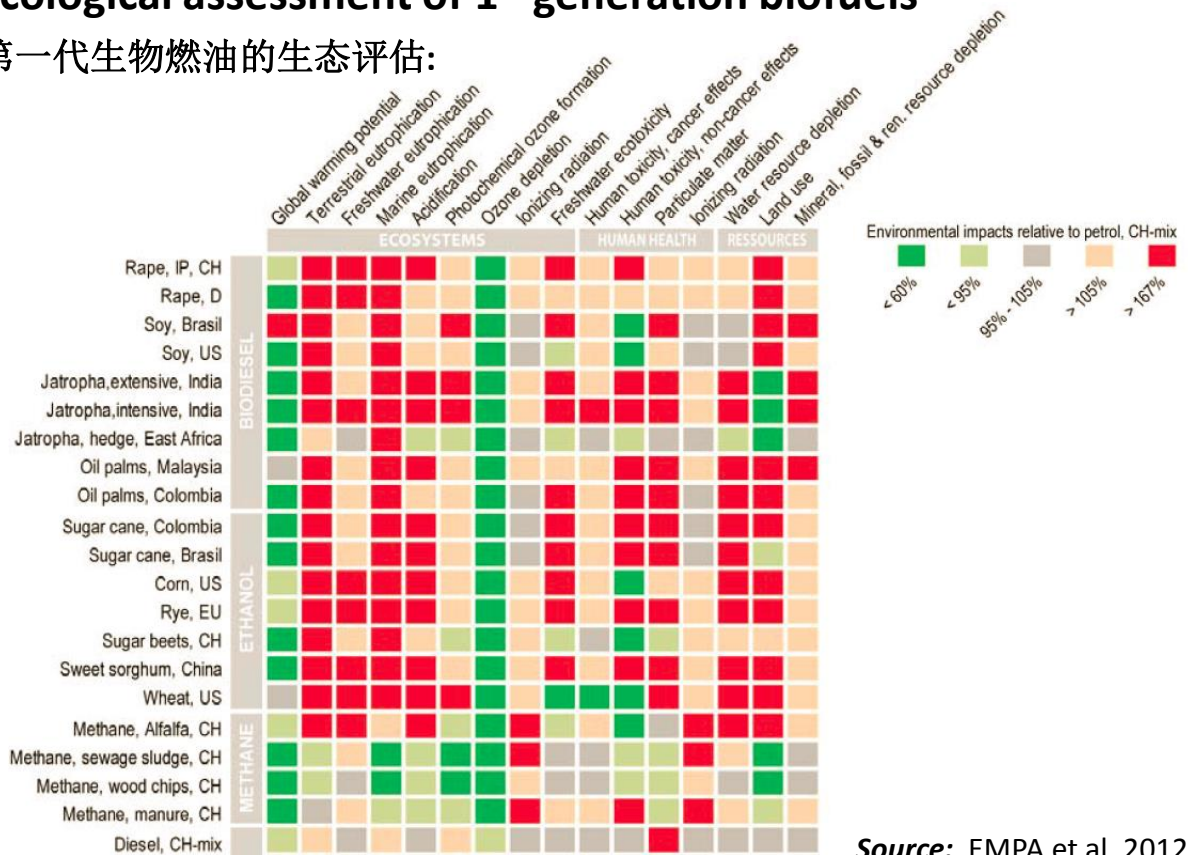
Fuel 燃料

Using alternative fuels and drive systems 使用可替代燃油及驱动系统

Improving fuel quality 提高燃油质量

Ecological assessment of 1st generation biofuels

第一代生物燃油的生态评估：



Source: EMPA et al. 2012.

Using alternative fuels and drive systems: Biofuels have high environmental impacts (2)

使用可替代燃油及驱动系统：生物燃油对环境的影响（2）

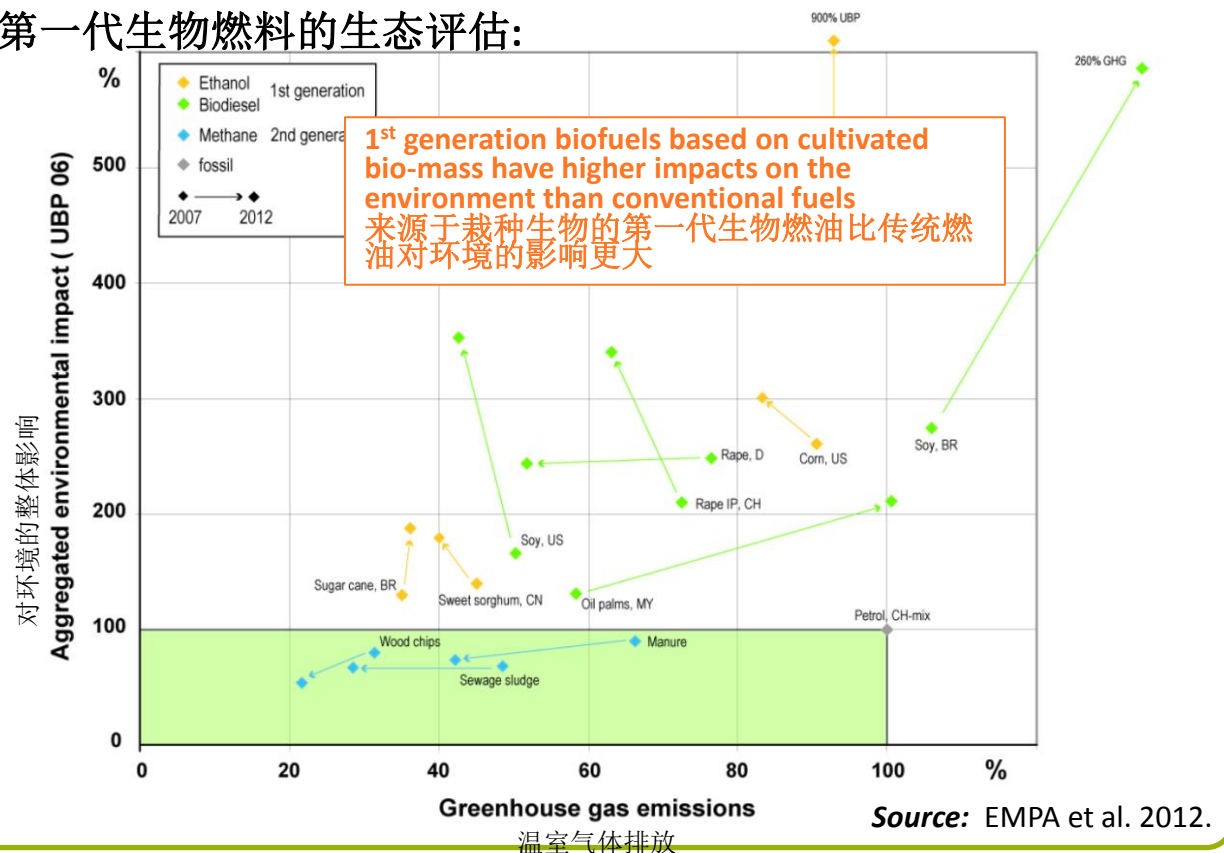
Fuel 燃料

Using alternative
fuels and drive
systems

使用可替代燃油及
驾驶系统

Improving
fuel quality
提高燃油质量

Ecological assessment of 1st generation biofuels (w/o iLUC) 第一代生物燃料的生态评估：



Options to improve the fuel consumption of trucks: Trucks with alternative drive systems

其他可提高卡车燃油效率的方法：替代驱动系统在卡车上的应用

Fuel 燃料

Using alternative fuels and drive systems

使用可替代燃油及驱动系统

Improving fuel quality
提高燃油质量

Examples of electric vehicles in the freight sector

在货运行业使用电动汽车

Hybrid truck: 混合动力卡车



Battery electric vehicle

使用电池的电动卡车:



Trolley truck 无轨电车:



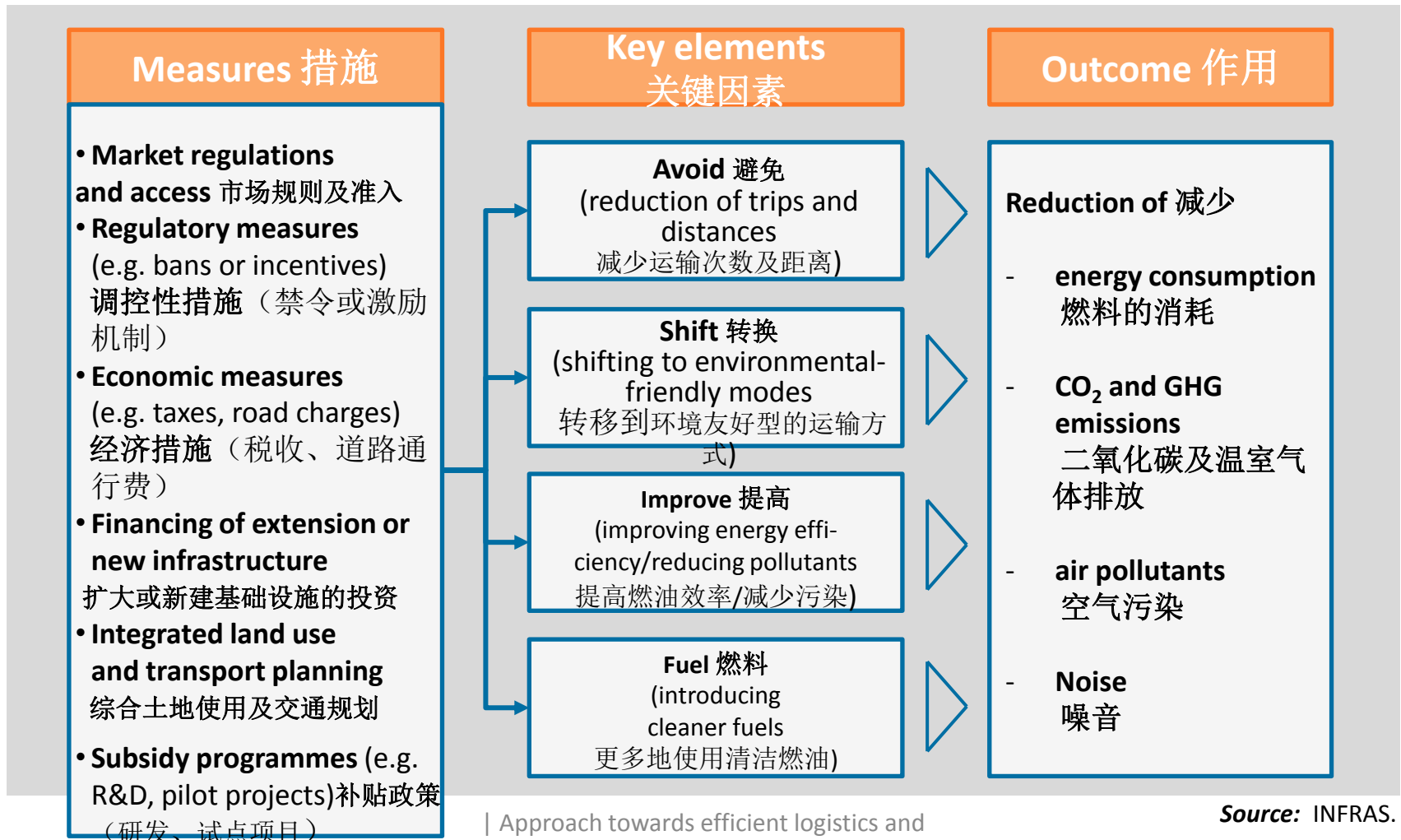
Vehicles with alternative fuels and drive systems are mostly costly and/or currently not deliverable
⇒ mid-term option
使用替代燃油及驱动系统的卡车价格昂贵/当前还不适宜推广使用
⇒ 中期选项

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Political measures and their impact in the freight transport sector

政策性措施及其对货运行业的影响



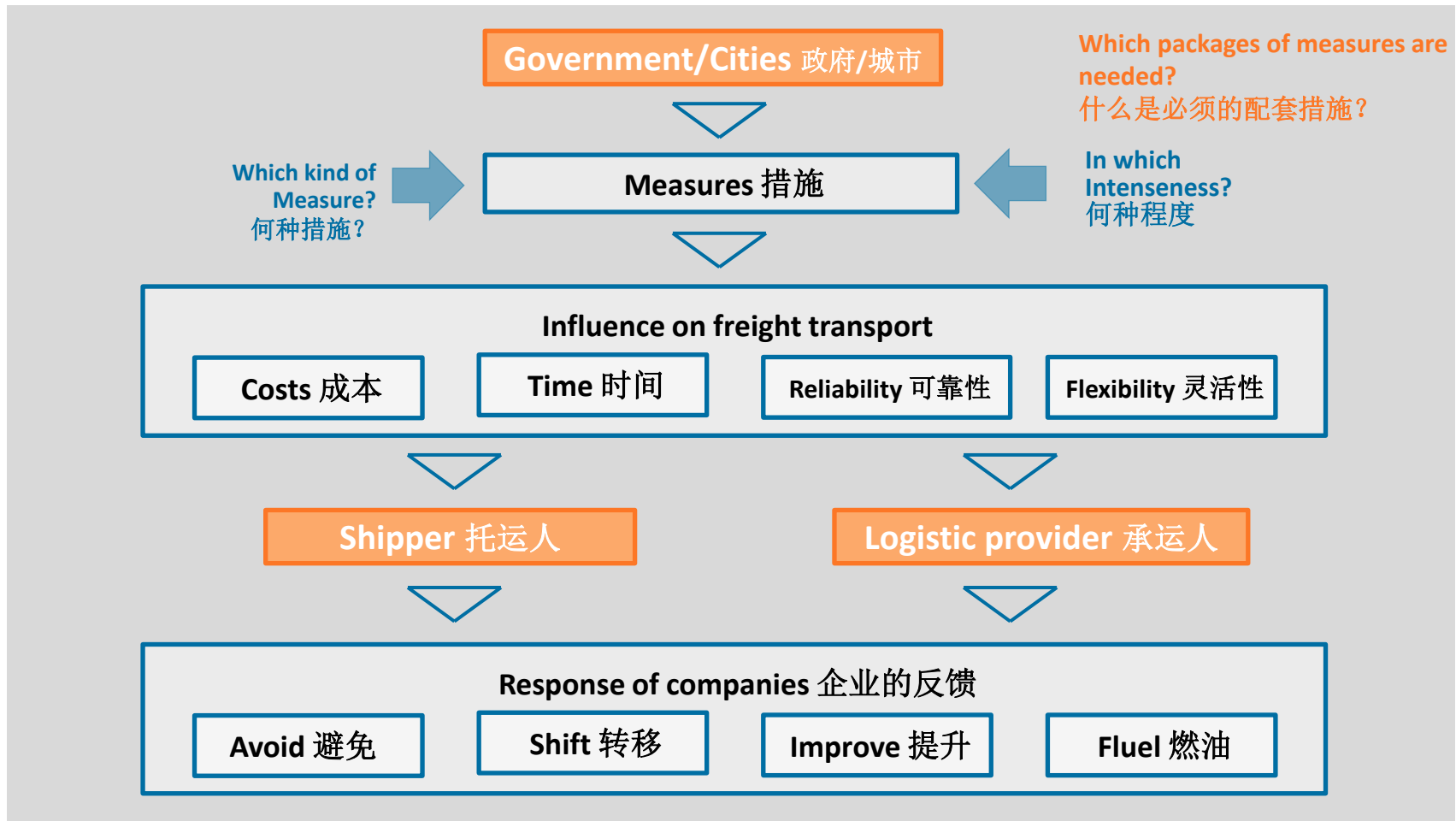
Overview of different categories of political measures and examples from Europe

不同政策性措施及欧洲实例

Market access and regulations 市场准入及规则	Regulatory measures 政策性措施	Economic measures 经济性措施
<ul style="list-style-type: none">• Access to railway network 铁路网络的准入• Homologation requirements (emission standards) 同素化要求 (排放标准)• Harmonised rules on vehicle dimensions 车辆尺寸的统一• Abolishment of cabotage 取消航权限制	<ul style="list-style-type: none">• CO₂ targets for vehicle 车辆减排目标• Weekend/night lorry ban 周末/夜间的卡车限行• Environmental zones 环保区域• Speed limits 限速• Obligatory in-job training (e.g. eco-driving) 必须的职业培训 (如节能驾驶培训)• Advantages for user of low emission vehicles 对低排放车辆的优惠政策	<ul style="list-style-type: none">• Fuel and vehicle taxes 燃油及车辆税• CO₂ taxes 碳税• Road user charges or tolls (for roads or areas) 道路通行收费• Train path prices 铁路轨道使用费• Public private partnership (PPP) 公私合作伙伴• Emission trading system 碳排放交易系统
Financing of extension or new infrastructure 基础设施扩建的融资	Integrated land use and transport planning 整合土地使用及交通规划	Subsidy programmes 补贴项目
<ul style="list-style-type: none">• Extension of railway network (and waterways) 铁、水路网络的扩建• Building of new terminals for intermodal traffic 新建多式联运枢纽• Extension of railway sidings 专线铁路的扩建• Segregation of freight and passenger rail traffic 铁路货运、客运线路的分离	<ul style="list-style-type: none">• Federal transport planning 联邦交通规划• Strategic planning for freight distribution centres and intermodal terminals 货运分拨中心及多式联运站的战略规划• Alignment of roads 道路联网• Air pollution and noise protection plans 空气污染及噪音防护计划	<ul style="list-style-type: none">• Subsidies / low interest rate for advanced introduction of new emission standards or for purchase of new trucks 对引入新排放标准及购买符合该标准车辆的补贴/低利率贷款• Funding of alternative fuelled vehicles 对使用替代燃油车辆的补贴• Subsidies schemes for scrapping old vehicles 报废旧车辆的补贴计划

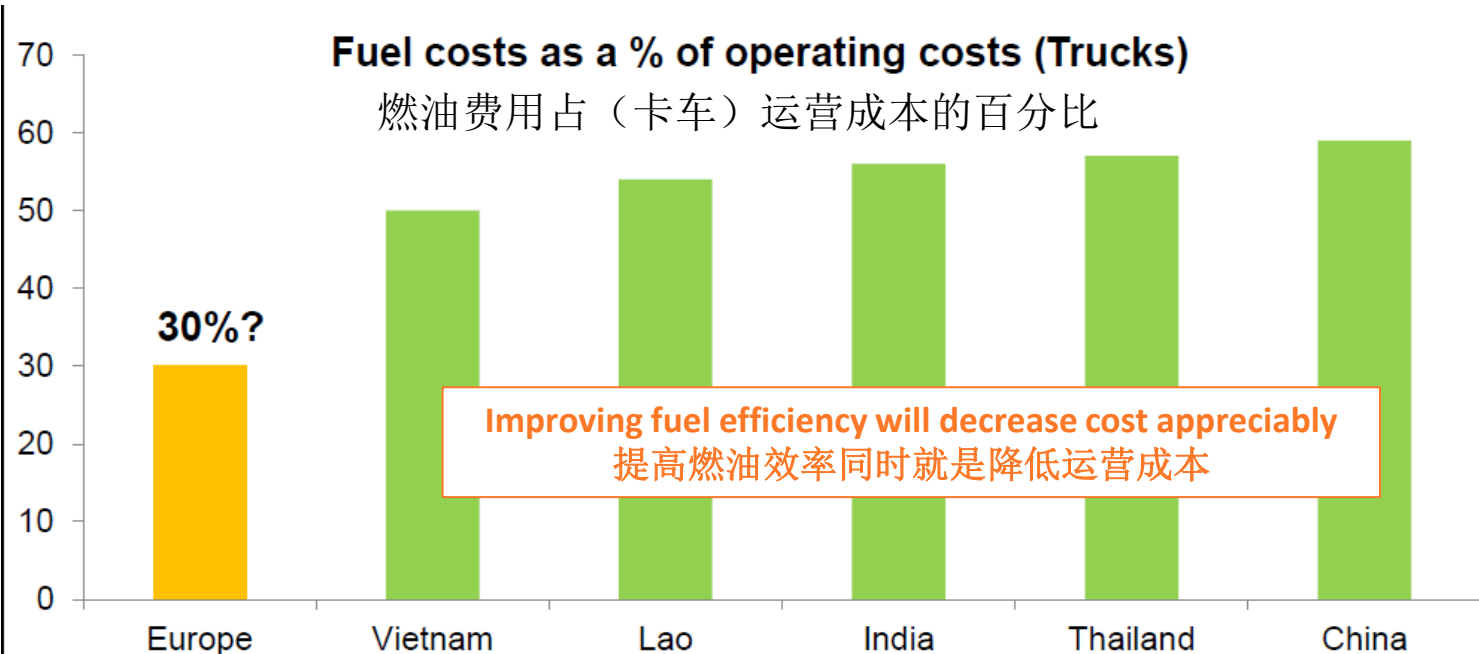
Effectiveness of measures depends on changes in the key parameters of freight transport

措施的效果取决于货运领域相关关键参数的改变



Truck operators should have an interest in reducing the fuel consumption of trucks...

运输公司应该对降低油耗同样具有积极性



Improving fuel efficiency will decrease cost appreciably
提高燃油效率同时就是降低运营成本

1. Average Salary of Truck Driver is around 500 USD/Month in India.

2. maintenance neglected

3. Low repair costs

4. Low taxes and insurance

5. Old trucks with poor fuel efficiency

1. 印度卡车司机的平均工资为500美元/月

2. 不重视车辆维护

3. 较低的维修费用

4. 较低的税和保险

5. 低燃油效率色老旧车辆

Source : Clean Air Asia, GMS EOC, Sudhir Gota

...but knowledge is low and the financial risks are high for small and medium-sized companies

但是中小型企业知识欠缺、并面临较大的资金风险

Reasons of German companies for non-implementing of energy saving measures: 在德国企业没有实行节能措施的原因



Green freight strategy for road transport: Conclusions

绿色货运策略：总结

- The key elements of a green freight strategy are 绿色货运政策的关键：
 - avoiding transport by logistic optimization, 进行物流优化从而减少运输量
 - shifting transport to more environmental-friendly modes, 将交通量转移到更环保的运输方式
 - improve fuel efficiency and reducing environmental impacts by using vehicle technologies and operational measures, 提高燃油效率、通过车辆技术和操作类措施减少对环境的影响
 - using cleaner fuels. 使用清洁燃油
- *Logistic optimization and improving fuel efficiencies* are options which have the potential to reduce environmental impacts and costs at the same time (win-win solutions).

物流优化及提高燃油效率可同时减少对环境的影响又降低成本（双赢解决方案）
- A comprehensive set of measures for green freight is available, but they must be localized to regions and nations based on analyses of barriers and bottlenecks; furthermore the measures must be combined in an optimal way (“packages”).

综合的绿色货运措施必须基于对本地区、国家瓶颈障碍的分析，并结合为一个优化的组合（工作包）
- Besides governmental measures actions from the logistic companies, shippers and logistic associations are needed to realize green logistic solutions.

除了政府的政策措施外，物流公司、托运人、行业协会的行动也是实现绿色物流的关键

Thank you for your attention

感谢您的关注！



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