

Institute for Transport Studies

FACULTY OF EARTH AND ENVIRONMENT



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## Green City Transport 绿色城市交通 The state of the art 的发展现状

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## Green City Transport 绿色城市交通



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- The green agenda 绿色议程
- Other sustainability objectives 其它可持续发展的目标
- The role of technology 技术的作用
- The range of transport policy options 可选的运输政策
- Developing an effective strategy 制定有效的战略
- The barriers to progress 前进面临的障碍
- Ways forward 走向绿色之路



## The green agenda: climate change

### 绿色议程：气候变化



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- To avoid dangerous levels of climate change
- 必须避免危险的气候变化
  - 2° maximum surface temperature increase  
表面温度最多可以升高2度
  - 50% emissions reduction needed by 2050  
2050年要减排50%
  - 80% in developed countries  
80%在发展中国家
  - Perhaps less for transport
  - Given relative ability of other sectors  
考虑到其他行业能力，交通行业可能会更少



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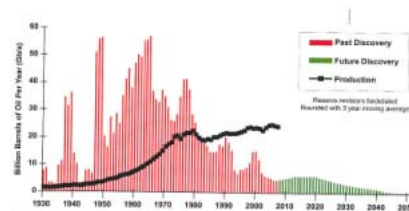
## The green agenda: peak oil

### 绿色议程：产油高峰



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- Oil production expected to peak in next decade 预计石油产量将在世年后打到峰值
- Leading to 将导致
  - Increased costs of oil  
石油成本上升
  - Greater volatility in markets  
市场波动增大
  - Increased political instability  
政治不稳定性加大



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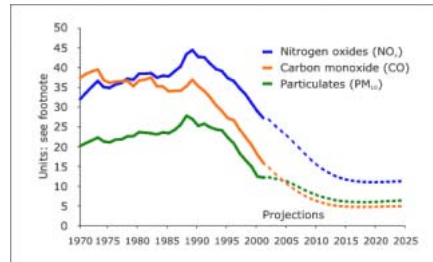
## The green agenda: pollution

### 绿色议程：污染



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- Substantial reductions in most pollutants since 1990  
1990年以来，大多数污染物有了大幅下降
- But still c100,000 deaths brought forward each year in Europe by transport-related pollutants  
但是在欧洲，每年仍有100000人死于交通带来的污染
- 70% of all emissions are in urban areas  
70%的排放在城市内部
- And traffic growth likely to offset further improvements  
与交通增长相比，所取得的进步微不足道



Source: NETCEN

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## The green agenda: noise

### 绿色议程：噪音



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- The hidden environmental threat
- 20% in Europe exposed to day time noise > 65dBA, causing
  - Extreme annoyance
  - 20% increase in risk of heart attack
- Around 20,000 deaths brought forward each year in Europe
- 暗藏的环境威胁
- 20% in Europe exposed to day time noise > 65dBA, causing
- 极端令人烦恼
- 噪音可增加20%的几率引发心脏疾病
- 每年在欧洲，近20000人死于交通噪音



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## The green agenda: casualties

### 绿色议程：交通事故伤亡



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- Casualty rates falling 伤亡比率下降
- But still 但是
  - 13,000 deaths peryear in urban areas in Europe 在欧洲，每城市中，年有13000人死于交通事故
  - and 210,000 serious injuries 同时还有210000人严重受伤
- With pedestrians, cyclists most at risk 骑自行车的风险最大
- Eight times greater risk on the roads than in the rest of daily life 在道路上的风险要比日常生活高处8倍



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## The green agenda: exclusion

### 绿色议程：例外



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- 30% of urban households in UK still do not own cars 在英国，30%的城市居民没有自己的轿车，
  - Predominantly in the lower income groups 尤其是低收入家庭
- Of those without cars 其他没有车的人
  - 30% have difficulty getting to hospitals 30%难以去医院
  - 15% have difficulty getting to supermarkets 15%难以去超市
- 40% of job seekers cite transport as a barrier 40%的求职者面临交通出行困难
- 20% of people have a long term disability 20%的人是终身残疾



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## The green agenda: health

### 绿色议程：健康



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- Health can be adversely affected by  
健康受到下列因素的严重影响：
  - Pollution 污染
  - Noise 噪音
  - Accidents 事故
  - Exclusion 排斥
  - Lack of exercise 缺乏锻炼
- In western countries 在西方国家
  - 25% of adults obese  
25%的成年肥胖
  - Potentially 60% by 2050  
可能在2050年肥胖率会达到60%



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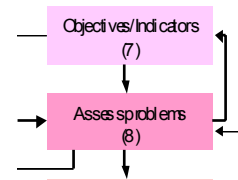
## The EC definition of sustainable transport

### 可持续交通的EC定义



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- **Social/**从社会角度
  - Provides basic access and development needs  
满足基本的出行和发展的需求
  - Supports safety, human & ecosystem health  
保证安全、人类和生态系统的健康
  - Promotes equity within and between generations  
平衡当代与未来的人们的权益
- **Economic/**从经济角度
  - Is affordable, fair and efficient/可行、合理、高效
  - Supports the economy, regional development  
支持区域经济发展
- **Environmental/**从环境保护角度
  - Limits emissions and waste within ability to absorb  
限制排放和废物在环境可吸收范围内
  - Uses resources within renewal, replacement rates  
提高使用可再生、可替代资源的比率
  - Minimises impacts of noise and use of land  
尽量控制噪声污染，减少占用土地



Source: EC (2001) in EC DGEEnv (2005)

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## The economic agenda: congestion

### 经济议题：交通拥堵



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- Total cost \$100bn per year in Europe
- 每年，交通拥堵在欧洲造成的总损失达\$100bn
- Or over 1.0% of GDP
- 超过GDP总量的1.0%
- Marginal cost in UK \$10bn in 2000; \$20bn by 2010
- 在英国，2000年的边际成本是\$10bn；2010年将达到\$20bn
- Around 80% of all congestion is in urban areas
- 约80%的交通拥堵情况发生在城区



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## The economic agenda: urban growth

### 经济议题：城市扩张



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- Western cities are growing slowly
- 西方国家城市规模缓慢扩大
  - 2% per annum /每年约2%
  - With some in decline
  - 部分城市规模缩小
- But many Asian cities are growing fast
- 众多亚洲城市的规模迅速扩大
  - Through population growth and migration
  - 人口增长和移民



China	1977	2007
Cities	190	670
Urban popn	18%	45%

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## The role of technology

### 科技的作用



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- Reducing carbon dependency
  - 降低交通对碳燃料的依赖
    - Fuel efficiency 燃料利用率
    - Alternative fuels 替代燃料
    - Electric/hybrid vehicles 电动/混合动力交通工具
    - Fuel cell vehicles 燃料电池驱动交通工具
- Providing new modes 提供新的交通方式
  - Personal rapid transit 快速客运
  - Cybercars 智能交通车辆
  - Automated buses 自动化公交



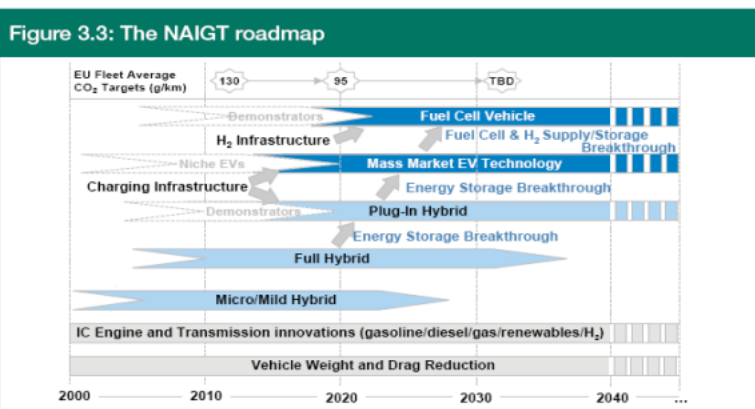
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## A technology road map

### 技术路线



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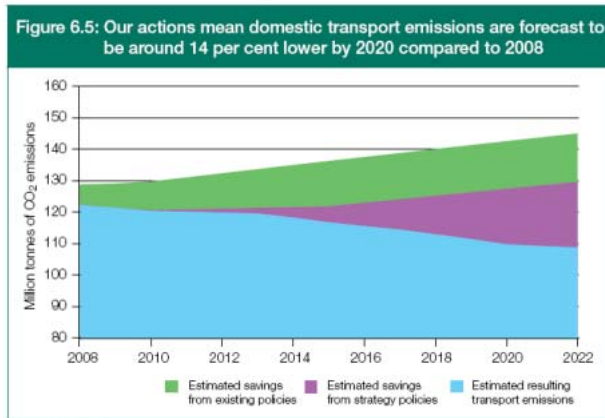
Source: An Independent Report on the Future of the Automotive Industry in the UK, NAIGT

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## The potential contribution of new technology 新技术的潜在贡献



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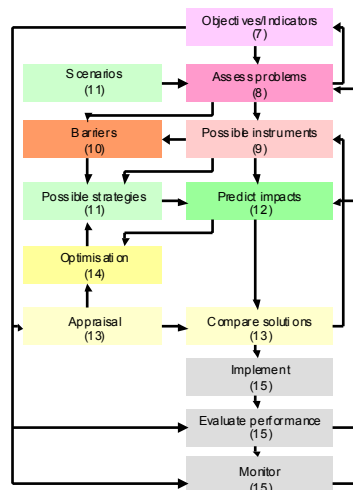


## A logical structure for transport policy formulation 交通政策范式的逻辑结构



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- Included in the 2005 European Decision-Makers' Guidebook
- 2005年欧洲决策者指导手册提出
  - Based on Cities of Tomorrow research programme
  - 根据Cities of Tomorrow研究项目
  - In [www.konsult.leeds.ac.uk](http://www.konsult.leeds.ac.uk)
- Developed to provide a structure for the Guidebook/经过发展，为指导手册搭建了结构
- Encouraging a logical sequence for problem solving/促生了一个解决问题的逻辑顺序
- While accepting that conventional decision-making is not necessarily so sequential
- 兼顾到常规决策不一定必须地按部就班



## A growing range of policy instruments

交通政策的选择增多



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- Management/管理
  - Car and bicycle sharing/私家车自行车共享
  - Walking buses/步行公共汽车
- Information/信息
  - Trip planning systems/出行预测系统
  - In-vehicle real time guidance/车内导航
- Awareness/意识
  - Personalised travel advice/个性化的交通建议
  - Company travel plans/公司交通计划
- Pricing/定价
  - Road user charging/道路使用收费
  - Private parking controls/停车控制



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## The KonSULT Knowledgebase

KonSULT知识库



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- Knowledgebase on Sustainable Urban Land use and Transport  
([www.konsult.leeds.ac.uk](http://www.konsult.leeds.ac.uk))
- 知识库：可持续的城市土地使用和交通
- Designed to provide consistent information on a wide range of policy instruments
- 提供信息：广泛的交通政策工具
- Using a consistent 11 point scale
- 用11分制来打分
- Based on first principles and on international empirical evidence
- 以基本原理和国际案例为基础




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## Policy Instruments in KonSULT/政策工具




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Land use 用地性质	Infrastructure 基础设施	Management 管理
		
Information 信息	Awareness 公众意识	Pricing 收费 ITS


## Evidence on performance: Land use planning


执行成果：土地利用规划



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- Higher density, mixed development and development linked to public transport services can reduce journey lengths and encourage less car use
- 高密度、混合开发、与公共交通衔接的开发可以缩短出行距离、减少私家车的使用
  - Doubling density can reduce journey lengths by 30%
  - 双倍密度可以减少30%的出行距离
  - But only if the transport strategy supports public transport, walking and cycling
  - 前提是提倡公交、自行车和步行的交通战略
- Limits on parking provision will help manage car use
- 限制停车可以控制私家车的使用





## Evidence on performance: New infrastructure

执行成果：新的基础设施



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- **New roads can reduce congestion and remove traffic from sensitive areas**

- 新建道路可以减少交通拥挤吸引敏感区域的交通
  - But will attract additional traffic
  - 但是会引起附加交通量
  - As much as 80% of traffic may be new
  - 多达80%的交通量属于新增交通量



- **New light rail and bus rapid transit can attract drivers from cars**

- 轻轨和BRT可以吸引私家车使用者
  - Around 20% of users come from cars
  - 20%的使用者来自私家车使用者
  - But impacts are limited to the affected corridors
  - 作用有限
- **And infrastructure projects will be expensive**
- 基础设施建设费用巨大

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## Evidence on performance: management and services/执行成果：管理和服务



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- **Traffic management can increase road capacity**

- 利用交通管理增加通行能力
  - Perhaps another 10% is feasible
  - 或许增加10%是可行的



- **Reallocation of road space to buses, pedestrians and cyclists will improve conditions for them**

- 合理的将道路空间分配给机动车、自行车和行人可以提高出行条件
  - But does not help much to reduce car use
  - 但是不会减少私家车的使用

- **Improvements in bus service patterns and frequencies will increase patronage and attract some transfer from the car**

- 提高公交服务条件和发车频率可以增加公交出行比例
  - Perhaps 10% of bus users come from cars
  - 大约有10%的公交使用者是由私家车转移而来

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## Evidence on performance: Information and awareness / 执行成果：信息和意识



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- Awareness campaigns appear to be successful in encouraging reduced car use and greater use of public transport, walking and cycling
  - 出行方式改变，增加公共交通、自行车、步行，减少私家车出行
    - Estimates suggest a 15% reduction in car use
    - 私家车使用减少15%
    - But these campaigns need to be sustained
    - 竞争还在持续
- Telecommunications may help reduce the need to travel
  - 通信的发展或许能减少交通需求
    - Perhaps a 10% reduction in commuting
    - 大约减少10%的出行
- Better information can improve efficiency and reduce travel costs
  - 及时掌握交通信息可以提高效率减少交通成本
    - For road users and for public transport
    - 道路使用者和公共交通



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## Evidence on performance: Pricing / 执行成果：收费




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- Simpler, lower fares can increase patronage, and attract transfer from car use 简单、低廉的收费标准可以增加乘客数量，鼓励他们从汽车转移过来
  - Perhaps 10% of new users come from cars 大约10%的新用户是从汽车转移过来的
  - But lower fares will require continued subsidy 但低廉的价格需要持续的补贴支持
- Congestion charging can reduce traffic levels and raise revenue to finance other policies 拥挤收费可以减少交通量，并用收益资助其他政策
  - Typical traffic reductions of 10% to 20% 通常交通量会减少10%到20%
  - Raising perhaps \$100m peryear for a city of 1m people 在一个100百万人口的城市可以收到1亿美元的年收入
  - But is unpopular! 但是不受大众欢迎!




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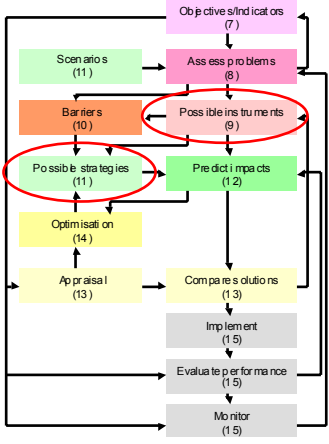
## Developing a strategy 制定战略




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- No one policy instrument will be sufficient alone 不能依赖单一的政策手段
- An effective strategy 有效的战略要
  - Uses the full range of policy instruments 充分利用政策手段
  - Ensures that each policy instrument reinforces the others 保证不同政策之间相互加强
  - Uses one policy instrument to help overcome the barriers to using another 用某个政策手段来解决另一个政策手段的障碍问题






## The contributions of different policies 不同政策的效果



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	Technology 技术	Land use 用地性质	Infrastructure 基础设施	Management 管理	Information 信息	Pricing 收费
Climate/Oil 气候/石油	●●●	●●	●	●	●●	●●●
Pollution/Noise 污染/噪音	●●	●	●	●●	●●	●●
Safety/Health 安全/健康	●	●	●●	●●●	●●	●
Exclusion 排斥		●●	●	●●●	●	
Congestion 拥堵	●	●●	●●	●●	●●	●●●
Growth 发展	●	●●●	●●●	●●●	●	●●



## What are the “best” combinations of instruments? 最好的组合?



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- Optimal strategies typically involve 最优的战略通常包括:
    - Substantial reductions in fares area-wide 大幅降低区域内的费用
    - Increases in service frequency within urban areas 在城市区增加服务频度
    - Peak period city centre road user charges 高峰小时市中心道路收费
    - Low cost increases in road capacity 道路通行能力以小成本的代价增长
    - And information and awareness (not tested) 信息发布和培养意识 (没有测试过)
  - Optimal strategies typically cost more 最优的战略通常成本更高
    - But financially neutral strategies can be found For only 15% lower benefit
      - Typically reducing car use by 15%
      - Achieve \$5000 to \$10000 benefits per capita
- Source: Optimal Strategies Project



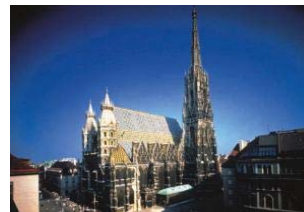
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## Case study 1: Vienna 案例分析1: 维也纳



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- Decision-making context 决策背景
  - Coordinated planning of transport 协调交通规划
  - Minor divisions of responsibility 责任不统一
  - But land use controlled by municipalities 用地性质由市政部门控制
- Instruments and strategy 战略
  - Enhanced public transport, walking, cycling 改善公交、步行、自行车交通
  - Demand management through parking control 通过停车控制管理需求
  - Polycentric, axial development 多中心轴向发展
  - Lack of land use control the principal constraint 没有用地性质控制是主要限制



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## Case study 2: Copenhagen 案例分析2: 哥本哈根



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- **Decision-making context 决策背景**
  - Coordinated planning of transport 协调交通规划
  - Long term land use strategy 长期土地利用战略
- **Instruments, barriers and strategy 战略和障碍**
  - Strong emphasis on cycling 强调自行车
  - Enhanced public transport and new metro 改善公交和地铁
  - Finger plan emphasises axial development linked to public transport 五指形规划强调了由公交连接的轴向发展
  - Demand management through parking control 通过停车控制管理需求
  - But further demand management needed; now considering road pricing 仍需要进一步管理需求, 正考虑道路收费



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## The ECMT study, 2002 2002年ECMT研究



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- Survey of 168 cities worldwide 调查了全世界168个城市
- Widespread agreement that integrated packages are needed: 一致认为需要综合方案:
  - public transport enhancements 改善公交
  - charging for road use 道路收费
  - better road network management 改善路网管理
  - compatible land use plans 相应的土地利用规划
- But implementing such integrated policy packages "has proven easier said than done" 说的比做的容易
- Need to tackle the barriers to policy development and implementation 需要解决制定和实施政策的障碍问题



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## The ECMT barriers to implementation 实施障碍



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- **Institutional** 体制障碍
  - Split or duplicated responsibility 职责分离/重叠
- **Process** 过程障碍
  - Identifying objectives, specifying problems 制定目标
  - Selecting possible solutions, appraisal, implementation 选择方案, 评价和实施
- **Political and public acceptability** 政治
- **Information and skills** 信息和技能
- **Financial** 财政
- **Legislative and regulatory** 法令法规



[Source: ECMT, 2002, 2006]

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## Recommendations: institutional

(Source: ECMT) 建议: 体制



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- **Coherent national policy framework for transport and land use** 统一的全国交通和土地利用政策框架
- **Coordination between government ministries** 政府部门协调
  - Transport, Finance, Planning, Environment 交通, 财政, 规划, 环境
- **Devolution of responsibility, finance and skills to lower tiers of government** 职能下调
- **Local transport and land use planning focused on travel-to-work areas** 当地交通和土地利用规划重视通勤区域
- **Local level coordination between transport and land use, and across all transport modes** 交通和土地利用的协调
- **Private sector involvement designed to coordinate commercial and public policy goals** 协调商业和公益目的



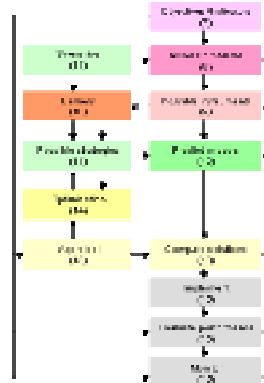
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## Recommendations: process

(Source: ECMT) 建议：过程



- Consistency over the long term 长期一致
- Clearly stated objectives and priorities 阐明目标
- Problem-based search for solutions 根据问题寻找方案
  - Employing the full range of supply-side and demand-side instruments 运用供给和需求两方面的手段
- Strategies designed to allocate, manage risk 设计分配、管理风险的战略
  - Based on integrated packages
- Appraisal, monitoring and evaluation based on agreed objectives and indicators, consistently applied
- Better understanding of good practice in implementation



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## Recommendations: acceptability

(Source: ECMT) 建议：认可度



- Political champions to achieve radical change 政治魄力实现根本变化
- Public understanding of problems and the need for action 大众认识
- Demonstration that proposed solutions are the most effective way of solving a problem 证明提出的方案是最有效的
- Effective consultation and participation throughout the policy process 整个政策过程中有效的参与
- Work with the media; avoid complex technical or emotional arguments 与媒体合作，避免复杂的技术性或感性语言



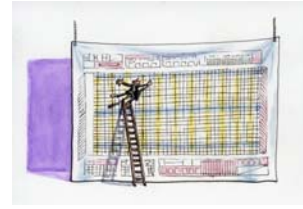
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## Recommendations: information

(Source: ECMT) 建议: 信息



- **Reliable and consistent transport data** 可靠的交通数据
  - From both public and private sector
- **Regular monitoring of performance against objectives, targets** 定期检查进度
- **Benchmarking and awards for successful authorities** 奖励成功的部门单位
- **Better understanding of the cost-effectiveness of different solutions** 更好地理解不同方案的成本效益
  - Improved and simplified models 改善、简化模型
  - Improved and comprehensive appraisal methods 完善评估方法
- **Enhanced skills** 改善技能
  - For users and well as operators, planners 包括使用者、运营商和规划师



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## Recommendations: finance

建议: 融资

(Source: ECMT)



- **Sustainable long term funding** 可持续的长期资金
  - Focused on the strategy, not specific solutions 强调战略, 而非具体的解决方案
  - Encouraging the most cost-effective approaches 鼓励采用成本-效益最优的方法
- **Taxation and charging are important policy instruments** 税收和收费是很重要的政策手段
  - Apply as close to the point of use as possible 要尽可能地在应用点应用
  - Reflecting externalities, consistent across modes 反映了外部性
- **Invest revenues in transport to increase acceptability** 将收入投资交通已增加认可度
- **Use private investment to support the overall strategy** 用私人投资支持整个战略



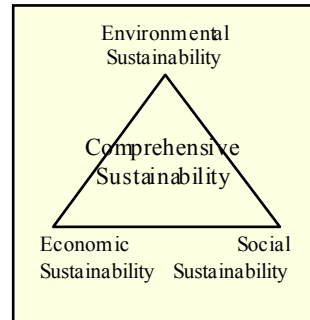
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## So how can we make cities more sustainable? 如何使城市更加可持续?



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- Sustainability is a direction of travel rather than a measurable goal 可持续发展是一个方向，而不是可以衡量的目标
- But we know how to make cities more sustainable 如何才能使城市更加可持续?
  - A greater focus on public transport, charging for car use and controls on land use 强调公交，收费，控制用地性质
  - With most transport provision paid for by the user 更多的使用者付费的供给
  - And greater use of "soft" measures 软措施
- There are policy limits in the outer suburbs 在郊区有政策限制
  - Resulting from urban sprawl 源于城市蔓延
  - Making it harder to provide alternatives to car use 使得难以提供可替代小汽车的交通方式
- But the main barriers are outside the traditional sphere of transport planners and engineers



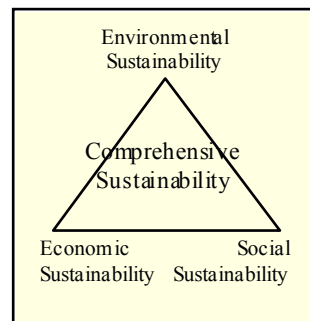
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## So how can we make cities more sustainable? 如何使城市更加可持续?



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- Overcoming those barriers requires 要克服障碍，就必须：
  - More coordination between the tiers of government, and between agencies at each level 更好地协调各级政府部门
  - Consistency in planning over the long term 保证规划长期一致
  - A problem-led approach to developing solutions and strategies 问题导向的解决方法
  - Political champions and more positive involvement of the public and media 政治魄力，以及更多的公众和媒体的参与
  - More effective use of data, models and appraisal methods 更有效地利用数据、模型和评估方法
  - Financial support for strategies, without inducing policy bias 为战略提供经济支持
  - Legislation and regulations to support these requirements 立法来支持这些需求



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[Source: ECMT]