Global advances in Intelligent Transport Systems and Road User Charging

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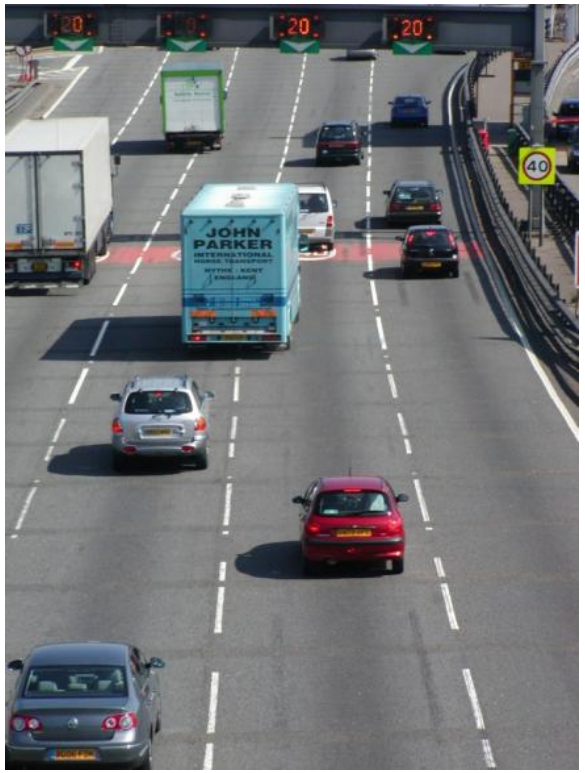


Agenda

1. Introduction
2. Intelligent Transport Systems (ITS)
   - Policy & technology developments
3. Road User Charging (RUC)
   - Policy options & current trends
   - Medium-term trends
   - Technology & systems developments
4. The future of ITS to 2020 and 2050
5. Summary & conclusions

2. Intelligent Transport Systems (ITS)

Intelligent Transport Systems

Definition

“ITS improves transportation safety and mobility whilst enhancing productivity through the integration of advanced communications technologies within related infrastructure and vehicles.”

Adapted from Federal Highway Administration (FHWA) - extract

Intelligent Transport Systems

Examples:

- In-vehicle systems
  - electronic stability control, lane departure warning, adaptive cruise control, intelligent speed assist etc.
- Vehicle-to-vehicle system
  - intersection arrival, collision avoidance systems and emergency notification systems.
- Vehicle-to-Infrastructure systems
  - traveller information services (real time navigation, car parking), urban traffic control, variable speed control, electronic tolling and freight management systems.
- Infrastructure-based systems
  - pre-trip planning, enforcement, traffic demand modeling, incident management etc.

Adapted from ITS Australia's list of ITS technologies (http://www.its-australia.com.au/about/)

Intelligent Transport Systems

Technology developments:

- The ‘connected vehicle’
  - The end of the proprietary in-vehicle environment
  - Step 1: Smart phones / tablet integration
  - Step 2: Open source application platforms (e.g. GENIVI)
- Improved location determination
  - GPS no longer the only option: Galieo, Glonass and BeiDou-2 (北斗卫星导航系统) = total 75 satellites by 2020
  - Augmentation: Wifi, accelerometers, dead reckoning, in-building broadcast beacons, etc.
  - Reduced errors, faster fixes and seamless coverage => opportunities for novel location-enhanced mobile services

Intelligent Transport Systems

Technology developments:

- Improved data fusion
  - Knowledge-based expert systems for incident management
  - Real-time traffic demand modelling
  - Prediction of journey time in urban environments
  - Evolution towards ‘Smart Cities’
- Improved mobile communication
  - Efficient spectrum usage
  - Machine-to-machine
  - Standardisation of vehicle-to infrastructure and vehicle-to-vehicle interfaces

3. Road User Charging (RUC)

Road User Charging

Policy aims

- To finance new or upgraded infrastructure
- To manage demand
- To reduce local emissions
- To contribute to roads maintenance
- To incentivise efficient use of road space
- To introduce usage-based taxation
- To commercialise road management

Road User Charging

Policy tools

- No demand restraint or ‘user-pays’ funding
- Route adherence / Intelligent Access Program
- Managed motorways
- Tolling:
  - Route-specific (e.g. toll roads, bridges and tunnels)
  - Area-specific (e.g. toll rings, network tolling)
  - Vehicle-specific (e.g. truck tolling)
- Demand management (e.g. urban congestion charging)
- Restrictive vehicle access schemes:
  - Vehicle class
  - Emissions class
  - Destination
- Workplace parking levy / cash-outs

Road User Charging: electronic tolling

Ålesund-Giske Bridge/Tunnel, Norway

Road User Charging: electronic tolling

Dartford-Thurrock River Crossing (UK)

Road User Charging: congestion charging

Policy Trends: congestion charging

- Reduce traffic demand by modal rebalance
- Can fund transport investments
- Some international success
- Political and public acceptability challenges remain
- Systems, technologies and business rules are mature
- Locally applicable

Road User Charging: congestion charging

London

Road User Charging: congestion charging

London (DSRC trial system)

Road User Charging: congestion charging

Stockholm

Road User Charging: urban tolling

Hong Kong

Road User Charging: urban and interurban tolling

India

Road User Charging: urban tolling

Oslo

Road User Charging

Policy Trends: truck tolling

- Europe:
  - vignette starting point
  - migration to electronic measurement of road usage
- National schemes: weak cross-border integration
- Emissions- and MGW-related charges
- Policy heritage aids acceptance
  - Switzerland, Germany, Czech Republic, Slovakia, France
- Platform for added value services: weigh station bypass, etc.

New Zealand: Road User Charges are applicable to vehicles over 3.5t manufacturer's gross laden weight and all vehicles of 3.5t (or less) powered by a fuel not taxed at source

Road User Charging

Multi-Lane Free Flow Enforcement (Switzerland)

Road User Charging

Heavy Goods Vehicle DSRC OBU detection point, Austria

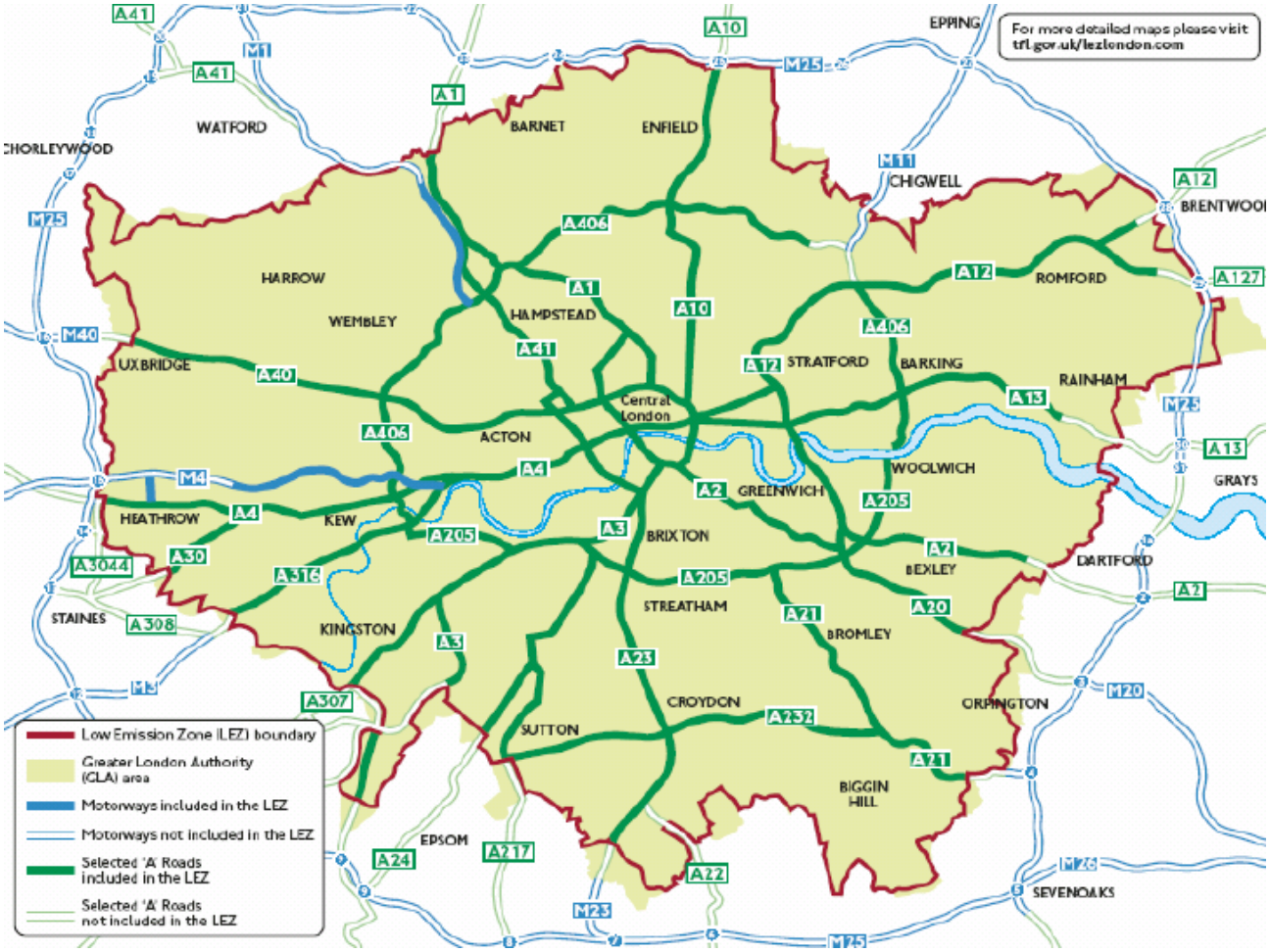
Road User Charging

Policy Trends: Low Emission Zone (LEZ)

- Restrictive access scheme
- Japan since 2003
- 70 cities and 8 countries in Europe
- London has the largest (1580km^2) since 2008)
- Germany has the most (47)

Road User Charging

London Low Emission Zone (LEZ)



Road User Charging

South Africa: N1 Pretoria

Road User Charging

Technology & systems developments

- Mature solutions
  - Toll plazas
  - Open roads
- Bankable with known performance
- Interoperable (business level)
  - Reduces cost of operation
  - Separation of charging from account management (e.g Australia and Ireland)
- Enforceable
  - Electronic Registration Information for enforcement (trialed in Emirates, Canada, China, etc.)
- Upgradeable: from toll plazas to MLFF

Road User Charging

Medium term policy developments

- Mixed policies (policy conflict?)
  - emissions-related tolling / charging
  - occupancy-based tolling (HOT lanes)
- Declining relevance of fuel taxation
  - increasing fuel efficiencies and alternative fuel vehicles
- Distance-based (VMT) charging / tolling / taxation
- All Electronic Tolling:
  - developed and developing countries: China, South Africa, etc.
- Emergence of cross-border service providers
- Emergence of investors in ‘assetless’ investments

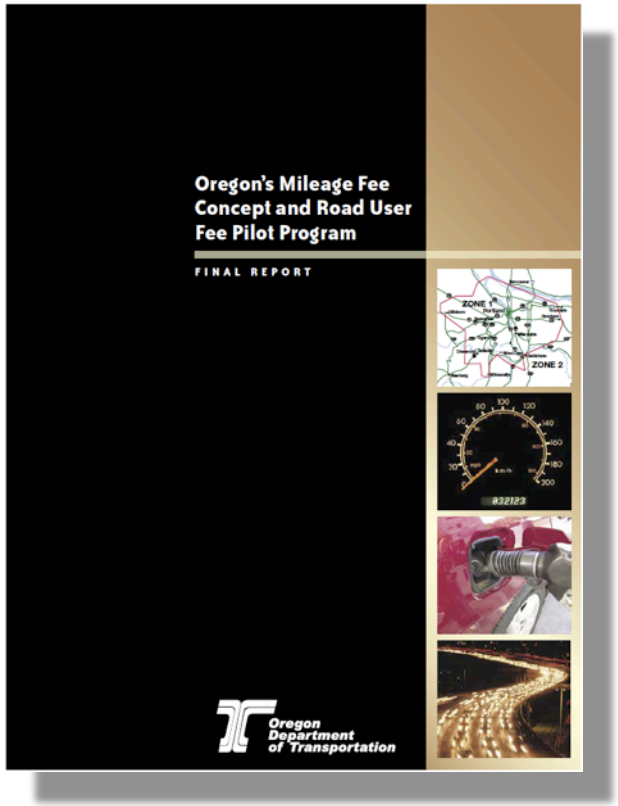
Road User Charging: Fuel Tax Replacement (US)

that all of the major areas of concern could be properly addressed, including the requirement that the program be as seamless as possible for consumers. At the conclusion of the pilot, some 91 percent of the participants said they would agree to continue paying the mileage fee in lieu of the gas tax if the program were implemented statewide.

Press Release: Oregon Department of Transport:

“Road user fee pilot shows ‘per mile fee’ viable…”

“Some 91 percent of participants would agree to paying a mileage fee in lieu of the gas tax…”



4. The Future of ITS to 2020 and 2050

The future to 2050: Current context

- Environmental
  - increasing environmental awareness
  - Reducing relative dependency on oil for transport
- Economic
  - Efficiency and cost drivers
  - National competitiveness
  - Economic growth linked to traffic demand
  - Broadly increasing affluence and motorisation
  - Backlog of infrastructure improvements and shortage of public funds

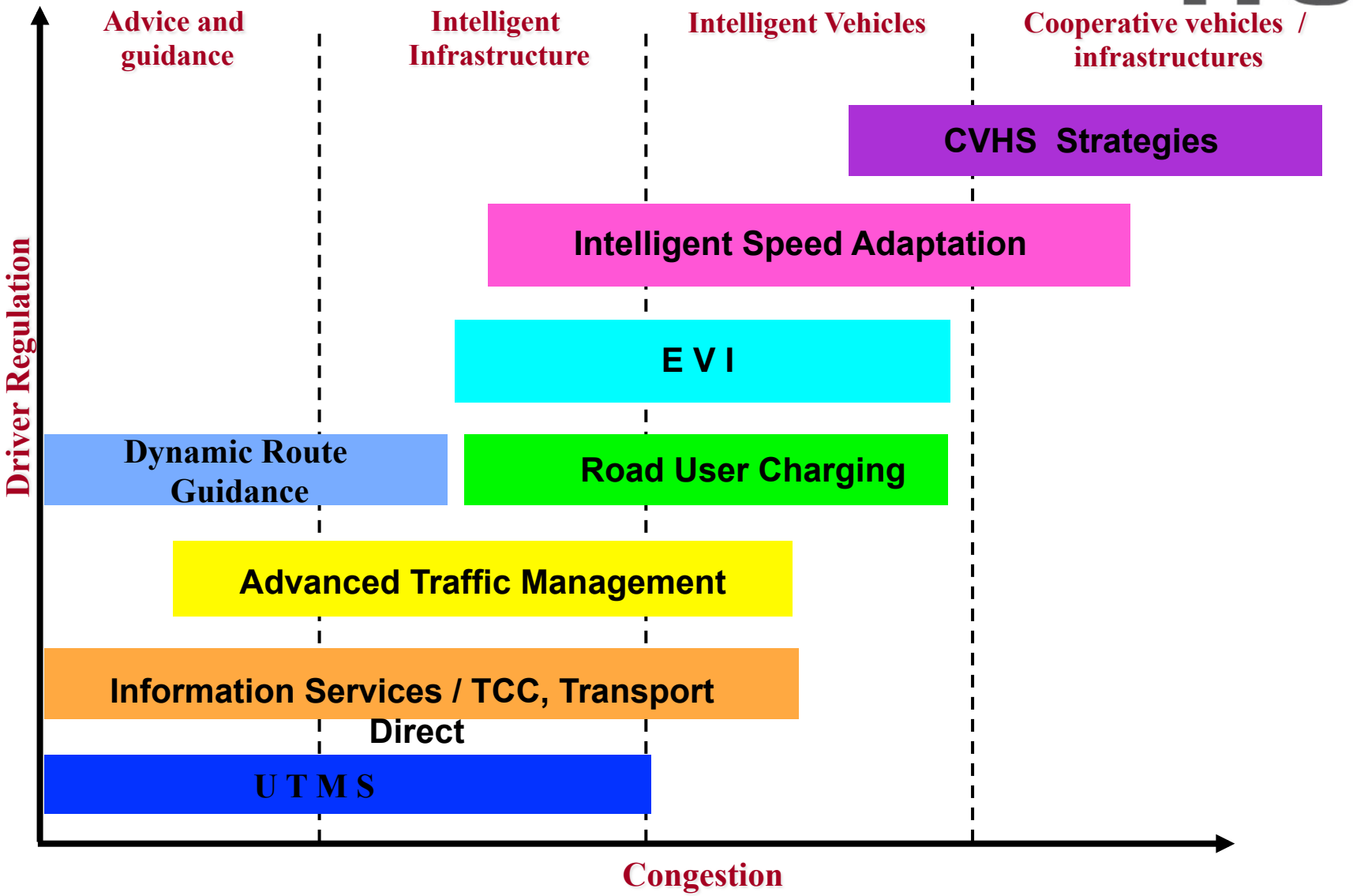
The future to 2050: long-term planning

Decisions made today will be with us for the next century

We need to invest in way that:

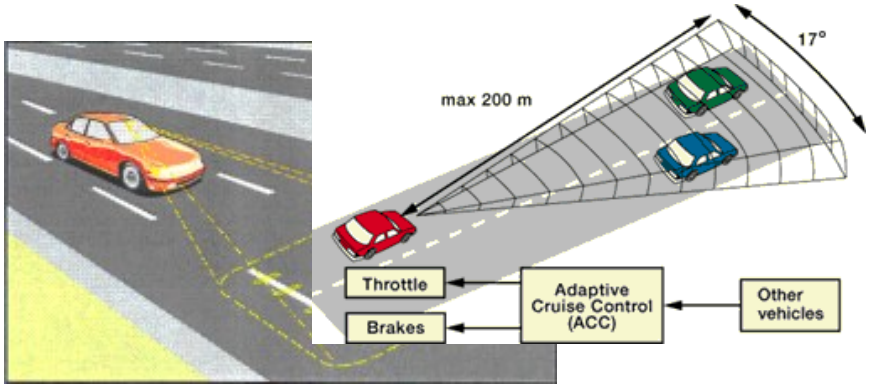
- Will deliver economic growth
- Responds to climate change
- Mitigates congestion
- Is robust to the uncertainties of the future

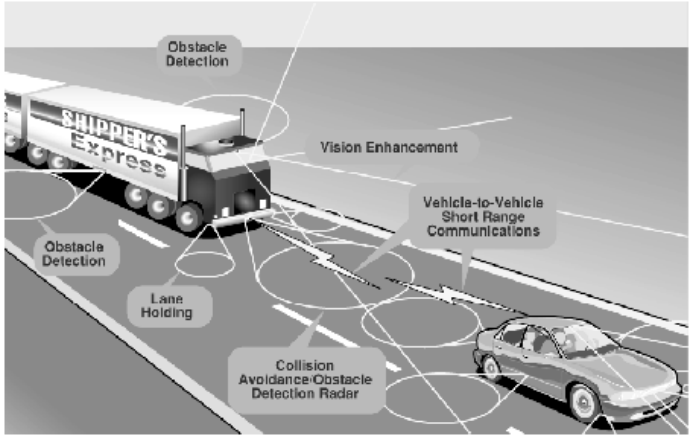
The future to 2050: short-term



The future to 2050: the connected vehicle

- Next generation Transport
  - Graduated driver support
  - Auto pilot (DARPA desert race)
  - Vehicle swarming
  - Better integrated with other modes
  - Robotic emergency support





The future to 2050: Foresight Futures to 2050

"How might science and technology be applied over the next 50 years to the design and implementation of intelligent infrastructure for transport and its alternatives that are robust, sustainable and safe?"

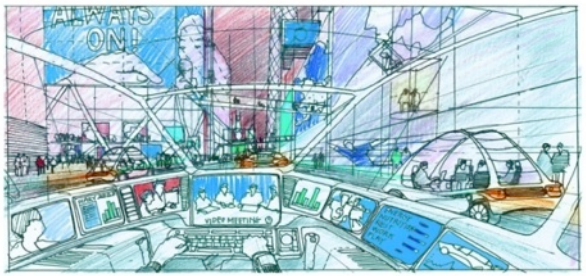
- The Foresight team was initiated by the UK Government
- Large stakeholder group and project advisory group of 22 representatives from academia, the police, Department for Transport, electronics companies, utilities, etc.

The future to 2050: Foresight Futures to 2050

Accepting of intelligent infrastructure

Good Intentions

Perpetual Motion



High impact transport

Low impact transport

Tribal Trading

Urban Colonies

Resistant to intelligent infrastructure

Source: Intelligent Infrastructure Futures

5. Summary & conclusions

Summary & conclusions

- Policy leads, technology enables
- There is a broad array of policy options
- Local solutions but in a global context
- Selective new capacity and make better use of current capacity
- Test sensitivity of plans against possible futures
- Think of investment in capacity in the broadest sense –
  - Transport - not roads
  - People and goods – not vehicles

"*The future is already here – its just not evenly distribut*ed[1]" so know what is possible and consider best-in class examples of policy and enabling ITS and RUC technologies worldwide.

[1] Source: *William Gibson, Fresh Air, NPR, 31 August 1993 (unverified)*

Thank you

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