



Intelligent Transport Systems (ITS) and their benefits

Who are ITS (UK)?

ITS United Kingdom is the UK's society for all who work in Intelligent Transport Systems (ITS). ITS (UK) has 160 corporate members and is an independent association financed by members' subscriptions. Members include Government Departments (DfT, BIS), Local Authorities (including Transport for London), small and large consultancies, manufacturers, software houses and system integrators.

What are 'Intelligent Transport Systems (ITS)'?

ITS is the use of technology, communications and information to deliver informed and efficient mobility and transport. It includes smart motorways, autonomous/driverless and communicating vehicles, urban and inter-urban traffic management, enforcement of speed limits, transport safety and security, and improved mobility. ITS optimises existing infrastructure to make transport more efficient, rather than providing extra physical infrastructure with its environmental dis-benefits and financial costs.

Quantified Benefits of ITS

Some illustrative examples of ITS and their quantified benefits are listed here. Categorisation of them is difficult because many systems and technologies have a range of different kinds of benefit. The source of the data includes ITS (UK) Fact Sheets 2012-15 (the 'Hallman notes') and its 'Local Authority Guide to Emerging Transport Technology'¹. The latter points out that Local Authorities are under continuing budgetary pressure but at the same time there is increasing pressure to address congestion, access to Public Transport, air quality, infrastructure for electric vehicles and better transport information provision; ITS technology can help to resolve this dilemma by delivering significant improvements for a fraction of the cost of new infrastructure. Some examples are given below. ITS also contributes to productivity and to job creation.

Health, safety and environmental benefits

Motor vehicle tailpipe emissions are a major contributor to health risks. A recent study by the Harvard Center for Risk Analysis estimated that in 2005 in the United States there were

¹ "Local Authority Guide to Emerging transport Technology", the Institution of Engineering and Technology and ITS(UK), 2014. <http://www.its-uk.org.uk/>

3000 premature deaths with a social cost of \$24billion due to congested traffic². An equivalent of 4,300 deaths in London per year is attributed to air quality related illness³; hence the introduction of an Ultra-Low Emission Zone (ULEZ) in 2020, covering the whole of Greater London. ITS can mitigate those hazards in various ways.

- Creation of traffic-free zones and Low Emission Zones in cities reduce pollution and premature deaths;



E-MOTE courtesy of Envirowatch Ltd

Figure 1: Environmental monitoring device

- Integration of vehicle systems with mobile communications and advanced mapping technology gives a potential UK fuel saving of 14%, or up to 2.9 million barrels of oil per year.
- Smart motorways+improve traffic safety as well as capacity;
 - A safety report following 3 years of operation of the M42 pilot scheme shows 2.25 Injury Accidents per month with 4 Lane Variable Mandatory speed limits compared to 5.08 with no variable speed limits - a 56% reduction.
 - Journey times in congested conditions were reduced by 16%, and journey time variability by 22%, making journey times more predictable.
 - Noise levels reduced by 2.1 dB(A).
 - Carbon monoxide and carbon dioxide emissions were both reduced by 4%, as was fuel consumption.
 - Subsidiary effects were a reduction in driver stress and an improvement in speed compliance. There were also high levels of driver satisfaction with the scheme.
- Average speed cameras deliver tangible improvements through casualty reductions, congestion improvements and improved environmental factors.



Figure 2: Fixed point speed camera

² "Evaluation of the public health impacts of traffic congestion: a health risk assessment", Harvard Center for Risk Analysis, in "Environmental Health" 2010, 9:65. See <http://www.ehjournal.net/content/9/1/65>

³ <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone?cid=ultra-low-emission-zone>



Figure 3: Average speed cameras on the A14 (Courtesy Vysionics)

- Killed or Seriously Injured (KSI) accidents are reduced by 70%. A typical installation prevents three KSIs every year, which, if valued at £1million,provides an annual saving of £50million over the 50 current sites.
- On a busy road (50,000 journeys/day), if 10% of vehicles save 2 minutes per day due to reduced congestion, this saves the economy over £600k per year on just one road.
- Drivers travel at an optimum speed for fuel economy; fuel savings (and emissions reductions) of 11.3% have been observed.
- eCall
 - eCall is a cooperative ITS service that automatically summons emergency assistance in the event of severe vehicle crash (such as would cause air-bag deployment), and creates a voice/audio link which may benefit passengers and rescue authorities.

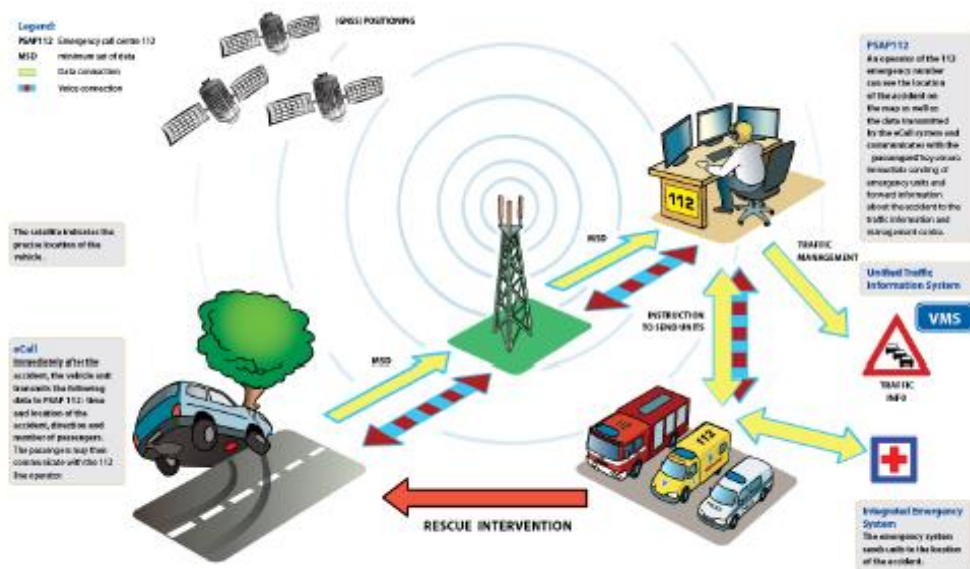


Image courtesy of European HeERO project

Figure 4: eCall

Public transport benefits

- Electric and hybrid public transport vehicles reduce pollution.
 - As part of its programme to improve air quality in the city centre, Milton Keynes Council has commissioned a fleet of electric buses.
 - **ITS (UK) acknowledges Government policies and financial support for programmes like this.**



Image courtesy of Milton Keynes Council

Figure 5: Electric bus in Milton Keynes

- provision of on-line information to buses, trains, and their passengers creates a better informed traveller and operator;



Figure 6: Traveller information (Source?)

- electronic ticketing enables faster, easier travel by public transport, and provides management information leading to improvements in the transport system;
 - national smart card ticketing and take-up of travel by public transport is encouraged by provision of comprehensive and reliable real time travel information. **ITS (UK) recommends that base data quality and reliable /**

fast national mobile communications coverage are urgent issues for attention, including by the Government

- Mobility as a Service concept (to be explained)
- In the Digital Matatus project⁴, GPS-equipped smartphones were used to compile lists of routes, arrival times, and stop locations of the unplanned bus network in Nairobi . which turned out to be surprisingly coherent and logical - and published in a downloadable Transit App.



Figure 7: A matatu (public bus) in Nairobi (Courtesy of the Digital Matatus project)

Driver and traffic management benefits

- on-line and road-side information to drivers: equipping the vehicle with driver assistance systems to improve the efficiency and safety of road transport;



Traffic display systems in Sweden

- in-vehicle information
- management of vehicle fleets, both freight and public transport, via on-line information and two way communication between manager and driver;

⁴ <http://www.digitalmatatus.com/>

- safety and security benefits for drivers and loads
- electronic motorway tolling and congestion charging⁵
 - the London congestion-charging scheme reported a 6% increase in bus use and a 20% drop in road traffic.

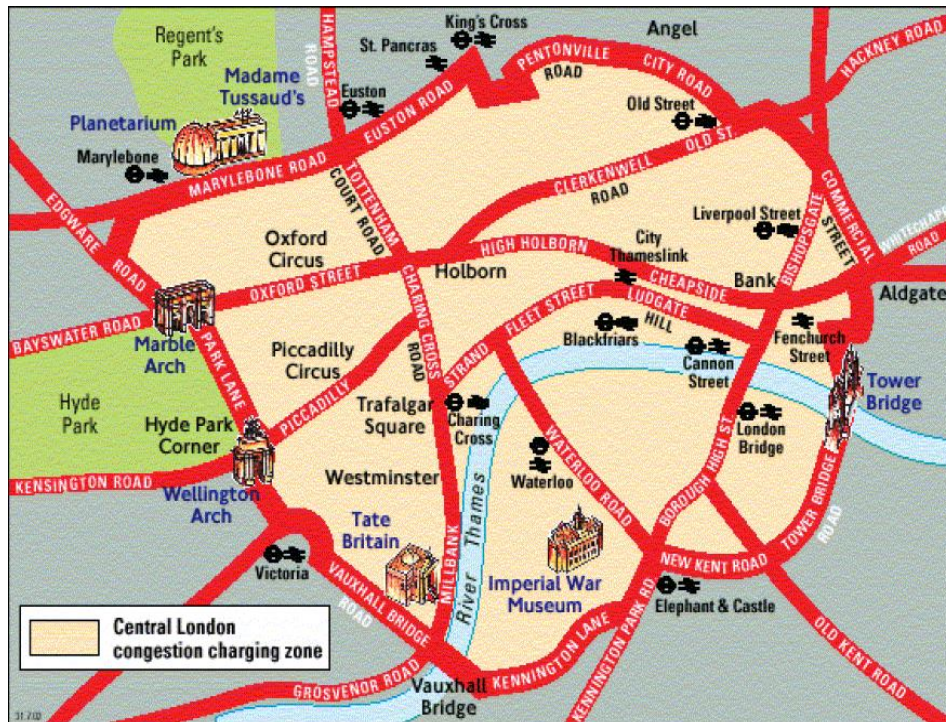


Figure 8: The London Congestion charging scheme (Courtesy of TfL)

- the Stockholm congestion tax has realised traffic reductions of more than 20%, and travel times have improved.



Figure 9: Stockholm pay station

- the German distance-based charging scheme for HGVs had revenues in 2010 of " 4.5 billion. Hauliers are also using less polluting vehicles.

⁵ "The Acceptability of Road Pricing". Walker, J. (2011)
<http://www.racfoundation.org/research/economics/road-pricing-acceptability>

- Congestion charging is usually thought to be unacceptable to the voting public. However there is evidence that a majority of the population will accept it given the right information and experience. The Stockholm congestion tax was initially opposed by 62% of voters but after a 7-month trial which demonstrated the benefits a majority voted to make the scheme permanent and it is currently supported by 74% of the population.
- Parking assistance
 - Helping drivers to find parking spaces minimises congestion and pollution. Charge rates can be sent wirelessly to meters. Motorists can pay from their mobile phone.

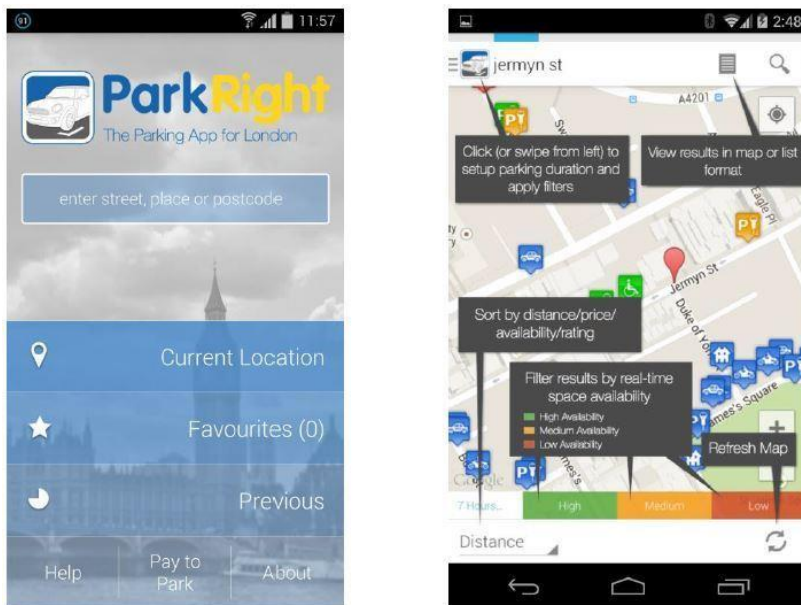


Figure 10: Westminster "ParkRight" smart-phone app (Courtesy Westminster City Council)

Economic benefits

- In 2011 ITS America, in a study funded by the US Department of Transportation, identified ITS as a major sector of the US economy: 3,000 companies with revenues of \$48 billion in 2009 and 445,000 jobs; revenues exceeded those for computers, movies and internet advertising. A global ITS market of between USD26 billion and USD39 billion is forecast by 2020. Although definitive data is not currently available for the UK, a similar situation undoubtedly obtains.
- Use of telematics+ITS devices in vehicles leads to a more efficient motor insurance industry, and also allows reduced premiums for young drivers.
- There are safety benefits by imposing location and timing restrictions on high risk drivers via insurance products
- Introduction of road pricing and congestion charging would have major economic as well as environmental and traffic management benefits
 - Investment in roads typically yields higher financial and social returns than investment in rail
 ○ Britain's roads are the most congested in Europe. Congestion is estimated to impose costs of around £20billion in the UK⁶.

⁶ "Moving the road sector into the market economy", IEA Current Controversies Paper No. 43, Gabriel Roth, June 2013

- The potential for benefits from a well-designed, large-scale road pricing scheme is unrivalled by any other intervention⁷.
- The OBR⁸ & IFS⁹ are predicting a £13.2B pa revenue loss from motor taxes by 2030, with fuel duty falling from 1.7% to 1.1% of GDP, and Vehicle Excise Duty from 0.3% to 0.1%.
- The Institute for Public Policy Research¹⁰ and the Association for Consultancy and Engineering¹¹ have published similar reports advocating the adoption of road pricing in the UK.

By investing in ITS and therefore improving the travel and transport experience of the public, whilst at the same time saving money on expensive transport infrastructure investments, politicians benefit the electorate and the Government.

ITS (UK)'s Vision for ITS in the UK

These strategic themes, adapted from the USDoT Strategic Plan 2015-2019, focus attention on intended outcomes of new technologies and systems as they are developed, tested, and adopted.

- Enable Safer Vehicles and Roadways by: developing better crash avoidance for all road vehicles; improved accident data collection; both infrastructure-based and cooperative safety systems.
- Enhance Mobility by increased system efficiency and improved individual mobility for all of society including both young and elderly drivers.
- Limit Environmental Impacts of transport (both global warming and pollution) by better managing traffic flow, speeds, and congestion.
- Promote Innovation by supporting research, developing evidence-based policies, and implementing ~~the~~ best practice~~s~~.
- Support information sharing through the development of standards, systems architectures and smartphone apps;
- Use advanced wireless technologies that enable communications between vehicles, the infrastructure, and portable devices such as smartphones and tablets.
- Automated/driverless Vehicles: research into systems that transfer some vehicle control from driver to vehicle. These technologies offer tremendous possibilities for enhancing safety, mobility, and the environment, but also pose new technical and policy challenges. The focus must be on enabling smooth and safe introduction of automated features into the nation's vehicles and transportation systems. **ITS (UK) is pleased to acknowledge Government foresight in setting up the three autonomous vehicle consortia and the joint DfT/BIS C-CAV unit.**
- As the scale of Communicating Vehicle implementation grows and automation of transport systems increases, vehicle manufacturers, infrastructure providers, innovators, and entrepreneurs will discover new opportunities to use the technologies and data generated. The Government must support this, **as it is doing through the three "autonomous vehicles" consortia**, whilst ensuring that consumer privacy is protected.

⁷ "The Eddington transport Study. The case for action: Sir Rod Eddington's advice to Government", December 2006.

⁸ "Fiscal sustainability report", The UK Office for Budget Responsibility, July 2011.

⁹ "Fuel for Thought : The what, why and how of motoring taxation", Institute for Fiscal Studies, May 2012.

¹⁰ "The Long road to ruin: Why the UK needs to reform motoring taxes". Institute for Public Policy Research, May 2014

¹¹ "Funding roads: Reducing inefficiency and securing investment in roads for future generations", Association for Consultancy and Engineering, October 2013

- **Big Data:** With increased connectivity among vehicles, organizations, systems, and people, unprecedented amounts of data are being generated. New methods to collect, transmit/transport, sort, store, share, aggregate, fuse, analyse, and apply these data will be needed for management and operation of the transport system.
- Interoperability is essential to ensure effective connectivity among devices, infrastructure and systems, regardless of where they are built and used.
- Accelerating Deployment: As new technologies and systems evolve into market-ready products, the Government must work with all stakeholders to manage adoption and deployment in the real world.

ITS (UK)'s view of the roles of Government and Industry in making this vision happen

Government should:

- Remove any regulatory or legal obstacles to the development and implementation of ITS;
- Take a long-term view in providing funding. Whilst there will be a number of quick wins, other investments may take a long time to mature. For example, road pricing needs education of the public, to create a shift in public opinion; but this should not be a deterrent to the funding both of education programmes and of demonstration schemes, including a shift from fuel duty and Vehicle Excise Duty to mileage-based and time-based charges.
- Encourage participation in standards activities, including by targeted funding for industrial companies, universities and other research institutes.
- Use procurement processes which favour ITS innovation including full participation of SMEs in the supply chain.
- Provide funding arrangements which allow ITS investments to deliver benefits over their whole potential life span.

Industry should:

- Participate in standardisation activities.
- Participate in Government-funded and EC collaborative R&D programmes.
- Take a long view on R&D and innovation activities.
- Be innovative and convince their clients to welcome this innovation.

ITS (UK) welcomes these Government activities

The Government already recognises the importance and benefits of ITS: that it is cheaper and more environmentally friendly than investments in physical/civil infrastructure, and that it can create new jobs and support UK economic growth, including within SMEs.

- ITS (UK) is supportive of Innovate UK's funded programmes
 - In particular, ITS (UK) congratulates Innovate UK, BIS and the DfT in setting up the three Autonomous Vehicles consortia (including finding an extra £9million in funding to support all 3 excellent consortia, and in setting up a joint DfT/BIS unit on autonomous vehicles.
- Smart motorways are rightly being rolled out across the motorway network. ITS (UK) believes that all congested motorway sections and other busy roads where appropriate should be smart.
- Electronic ticketing, including the use of smart-phones, is being rolled out in many areas, with benefits including increase in patronage of public transport, and reduced costs.

- ITS (UK) acknowledges some key announcements in the Summer Budget 2015, including its stress on the importance of roads to the national economy and in particular the hypothecation of VED to roads. (From 2017, there will be a flat rate of £140 for most cars, except in the first year when tax will remain linked to CO2 emissions).

What does the ITS industry and researchers want from politicians?

Our message is about making transport more intelligent and the difference that will mean to the everyday lives of people as well as commerce and economics. We believe that the wider adoption of ITS will benefit the country and its citizens in economic, environmental, productivity and health terms, as well as making life better for travellers.

The UK is recognised worldwide for innovation in ITS. However, this is a rapidly-progressing area and our leading position is being undermined as ITS experts retire and there are insufficient qualified and motivated people to replace them . with detrimental effects both within the UK and externally via exports. We now lack knowledgeable Local Authority staff and there has been a loss of ITS capability in DfT due to cutbacks.

ITS (UK) makes the following requests:

Ask 1: Better education of decision makers and implementers on the benefits of ITS – both existing and new staff

The current successes and the future potential contribution of ITS are not sufficiently well recognised by decision makers and implementers of our transport services. Education is needed at all levels, but especially at the level of decision-makers.

Ask 2: A recognition of the importance of road pricing, and a willingness to consider and explore how best to implement it.

It is generally accepted amongst transport professionals that, as Eddington put it, ~~the~~ potential for benefits from a well-designed, large-scale road pricing scheme is unrivalled by any other intervention~~q~~(Eddington, 2006). That view was endorsed by the UK Department for Transport in ~~‘Towards a Sustainable Transport System’~~(DfT, 2007), where it states: ~~‘The~~ Government accepts the Eddington analysis regarding the exceptional case for exploring the potential of road pricing~~q~~

We see road pricing as inevitable: it is the best tool to manage congestion and pollution; As the OBR has pointed out, fuel duty revenue is declining due to more efficient engines and use of alternative-fuels. There is much evidence that road pricing is acceptable to voters, if addressed and explained in the right way; it works and costs of implementation are falling; but there is much ignorance and misunderstanding; education and demonstration are needed. ITS has a core role in providing the technology for secure and efficient road pricing.

There is a strong case for being better prepared and doing some work on the sorts of policies and technologies other countries are examining whereby the tax regime moves from ownership and fuel taxes to taxation by type and place of vehicle usage. Government should work on this, in partnership with Local Authorities and industry.

Ask 3: A quantification of the importance of the ITS industry to the UK economy and to exports

As indicated above, in 2011 a Dept. of Transportation/ITS America study identified ITS as a major sector of the US economy. The Government/DfT should fund a similar study of the UK, quantifying the importance of the ITS industry to the UK economy and to exports, and its effects on national productivity.

Ask 4: A comparable level of investment in roads as there is in the rail network

Most freight traffic travels by road rather than by rail . typically 70-85% by weight depending on the country, and a much higher proportion by value. Most people (again around 85%) travel by road rather than by rail. Road transport is vital to the national economy.

ITS (UK) recognises the importance of investment in the rail network, but asks that there should be a similar level of investment in road transport and, particularly, in ITS which can provide huge economic benefits. We should not automatically think %ains good, cars bad+.

Ask 5: Use procurement processes which favour innovation in ITS and allow systems to deliver their full life span potential through funding for maintenance and upgrades

Ask 6: Update the cost-benefit appraisal process for transport investment

It does not currently value the soft benefits and what can be achieved by better management of what's already there and thereby favours new infrastructure. Also, reduction in fuel use appears as a %egative+ due to the loss of treasury revenue.

Ask 7: Sponsor more trials

In many cases the only way to be sure of benefits and dis-benefits from something new and to see how the public react is to %uck it and see+. **The 'driverless' trials are a good example.**

Ask 8: Make sure the numerous Government initiatives are coordinated.

This should include Innovate UK and the various %atapults+. **The joint DfT and BIS Centre for Connected and Autonomous Vehicles is a major step towards doing this but this is only one aspect of ITS.**

Ask 9: Sponsor Guidance on Best Practice for LAs.

This will save time, effort and money