



Intelligent Infrastructure Futures

Towards sustainable transport

Society faces a challenge as to how to promote and sustain economic growth while reducing the environmental impacts of transport. We will have to make large scale changes in transport – in technology, the built environment and social behaviour – if we want to achieve dramatic reductions in emissions.

In most countries, fossil fuelled road transport is fundamental to how we lead our lives. If we want to reduce environmental emissions from transport we have two options: improve the environmental performance of the technologies we use in transport; change how we use transport. To achieve the latter we will have to travel less, or use less polluting modes of transport.

The challenge for society – and policy – is to promote and sustain economic growth while reducing the environmental impacts. So far our response has been inadequate. For example, the EU's transport policy remains centred on economic growth and responses to congestion, with environment usually of lesser priority.

The UK also has conflicting policies, with strategies on the choice of schools for example and centralisation of hospitals seemingly designed to encourage travel. In its energy White Paper of 2003, the Government adopted the goal of a 60% reduction in emissions of greenhouse gases from 1990 levels by 2050. In contrast, in the same year the aviation White Paper predicted a 300% increase in air travel by 2030. Catered for by an extensive airport expansion programme, this increase in air travel could increase aviation's share of total emissions effectively to 30% by 2030, up from 12.8% of the total in 1990.

Cleaner transport technologies

Various technologies could reduce emissions of greenhouse gases by more than 50%, such as electric vehicles, or fuel cells, with the fuel produced using renewable energy.

Apart from their ability to change fuels, electric drives have significant advantages. They can achieve 90% efficiency in energy conversion compared to 25% for petrol vehicles. Hybrid electric vehicles, with an internal combustion engine linked to an electric motor and storage batteries, are already close to being commercially competitive.

The path to cleaner aviation technologies is less clear. Aviation fuel costs are not subjected to taxation, however they represent around 15% of an aircraft's operating costs, so energy efficiency has long been a priority for designers. Current technology already represents a mature combination of airframe and turbofan. While we can expect a further 40% improvement in efficiency by 2050, if air travel grows by 300 to 400% there will still be a large increase in emissions of greenhouse gases from aviation.

Policy and practice

Concerns about congestion and the environment have led many countries to change policy direction. Policies have, in part at least, moved from 'predict and provide' – where the objective is to build new infrastructure to meet increases in demand – to attempts to restrict the use of private cars. The change is partly a recognition that increased supply, building more roads, induces more demand, more traffic – society simply cannot build enough roads to satisfy demand. Intelligent infrastructure can increase the capacity and efficiency of the existing transport networks.

This development takes transport policy into a much more difficult area. It is trying to change behaviour instead of simply following social trends. Persuading society to reduce transport emissions to very low levels requires a considerable strengthening of the new direction of transport policy.

Travel is a part of all lifestyles. Transport systems are a part of the built environment: their use is an expression of individual identity and culture. Therefore, to reduce emissions, we have to consider the built environment, lifestyles and technologies as a whole.

Changes to transport systems

Achieving a society where transport has a low environmental impact will require fundamental changes to transport systems. This will require long-term thinking because of the very large investments in the built environment, infrastructures and vehicles. Such challenges as the need to put in place a supply and distribution network for hydrogen will require considerable commitment, not least from vehicle manufacturers, who have traditionally played little part in developing the infrastructure.

Innovation policy will be an important part of cultivating change in transport technology. In particular, policy can help to create the conditions in which system builders can experiment and demonstrate new low-carbon transport applications. Experiments in new ways of living and getting around could be the start of a long term shift.

This Research Brief is based on the Research Review written by Jonathan Köhler of the Tyndall Centre for Climate Change Research for the Foresight Project on Intelligent Infrastructure Systems. Series editors Professors Phil Blythe, Glenn Lyons, Will Stewart and John Urry. Editor Michael Kenward.

The full version of this review is at www.foresight.gov.uk