

Clean air... act



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WORDS BY **DAVE WILLIAMS**

The ITS World Congress in Copenhagen demonstrated clearly how ITS can be used to deliver a wide range of environmental benefits which is something very important to Atkins Senior Managing Consultant in Environment and Transport, Dave Williams, who has been heavily involved in investigating how technology can help in the clean up of our air

We spend a lot of time dreaming of exciting futures for transport and mobility. From autonomous vehicles to Hyperloop, Mobility as a Service to drone deliveries, a lot is being promised. A transport system that can revolutionise the way we travel, improve

our streetscape, increase accessibility and make safety concerns obsolete. These are all reasons to be excited, and the industry agrees that achieving this utopian future requires investment and planning today.

Whether this is achieved or not – years or decades from now – we have issues that require immediate attention. Across the world, urban areas suffer from poor air quality, and residents and visitors suffer from ill health.

Emergency

The World Health Organisation (WHO) estimated 3.7 million premature deaths per year could be attributed to poor air quality. London’s Mayor has referred to air pollution as a ‘public health emergency’. In New York, air quality is improving, but it’s recognised that it disproportionately affects already disadvantaged communities.

The latest report on Global Warming by the Intergovernmental Panel on Climate Change (IPCC) suggests that limiting global warming to 1.5°C would require

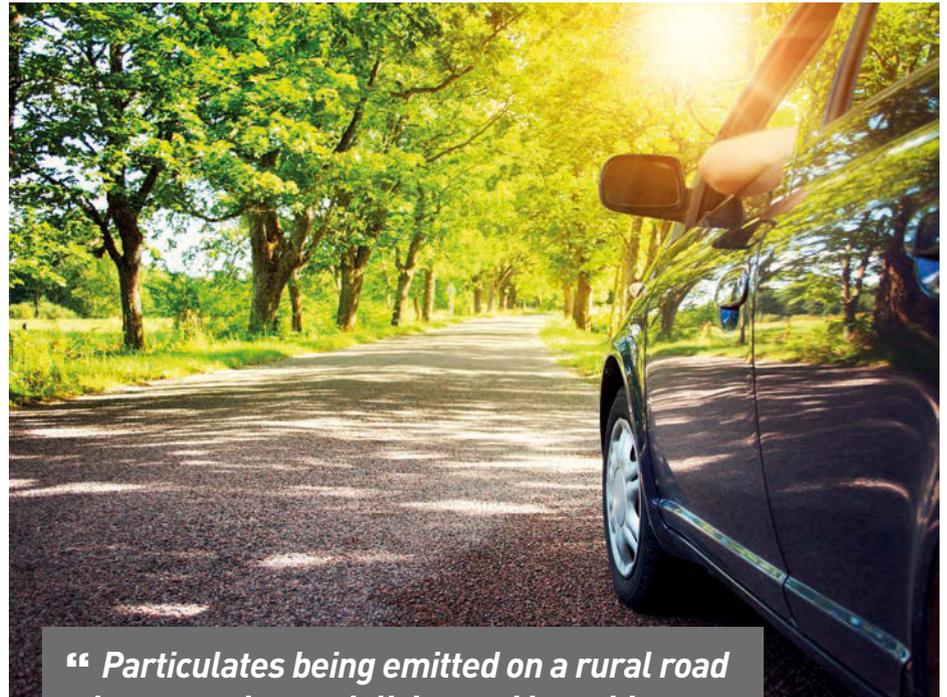
“rapid and far-reaching” transitions in land use, energy, industry, buildings, transport, and cities. We need a similar call for action around air quality – rapid and far-reaching action for the benefit of human health.

The objective is clear – we need to clean up the air in our towns and cities. Transport is an enormous contributor to poor air quality. Depending on how you cut it, you can blame road transport emissions for anywhere from one-third to three-quarters of the dirty air we breathe.

We have greenhouse gas emissions, but don’t think these will be solved with electric vehicles. Greenhouse emissions are associated with these as well - not just in power generation but the whole life cost.

Quality

On the local air quality side we have bad tailpipe emissions like NOx and particulate matter. NOx is a primary cause of NO2 and that’s the thing that across Europe we’re failing to meet our targets on, and there are lots of health impacts associated with that. We’ve also got the multiplicity effects of transport. Every extra car on the road is



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causing issues for other cars.

With all problems, we need to start by understanding them more. At the moment, a lot of our understanding is based on legislation and measurements we need to take to show how we’re meeting the regulatory requirements.

And in a lot of cases those are very old – they may have been put in place 20 years ago and are very coarse. And we don’t really get a good picture of how people are exposed to pollution, where people are exposed and what spatial and temporal variations there are. One of the things ITS and a connected transport system provides us with is an opportunity to collect data in a much more efficient way and a cheaper and more effective way.

Attribution

It’s also difficult to measure what is attributable to traffic and what is, say, caused by someone lighting their wood-burning stove. We call it source apportionment – how do we identify what is or isn’t caused by transport. But also within the transport element we want to understand what’s been caused by the bus, by a taxi and by private vehicles. We want to be able to separate them out and make a really informed decision about what we’re doing. If we

can solve problems by retrofitting the bus fleet, that’s great and is something we can do that isn’t about traffic management at all. And if it’s caused by the private car fleet, we look at other measures to do it. So it’s a really important thing. How do we do it? Well, we do our best with the measurement we can do. And although they can be affected by people’s stoves or cigarettes, if we get enough samples and take enough measurements then we build up a picture. I would say that’s similar to any other measurement out on the network, for example inductive loops can be shadowed and things like that. It’s about getting a really good record of observations, measuring as much as we can as often as we can, as practically as we can.

And remember all emissions are not equal. Particulates being emitted on a rural road where people aren’t living and breathing are going to have a different effect than if they are emitted in a densely populated area. The word to focus on is populated. We must not lose sight of why we want to improve air quality. This is fundamentally about damage to human health. It’s also about the economy and an inefficiency in a system, but what we are really trying to do is improve our air quality so we have less damage to people. The estimates vary but we’re looking at something in the region of four hundred thousand premature deaths every year across Europe caused by poor air

quality, and transport is a major contributor to that. That’s the number we’re looking to get down, making sure people’s lives aren’t shortened by poor air quality.

Inevitably that means we focus on densely populated urban areas. There is a dense operation of the road network here so we get higher emissions anyway, and because there are a lot of people, this becomes extra detrimental.

The other thing we have to think about, as well as where the emissions are produced, is who is breathing them in. As I say, London’s Mayor has talked a lot about this, about it often impacting on the most vulnerable members of society – the elderly and schoolchildren – so we need to look at it as part of the whole system.

Legislation

One of the issues is if you legislate on targets, it means you can have a mindset of simply setting out to hit those targets for their own sake and not for the reason they were set. It can even open the door to manipulation of the figures, or simply different results depending on where air quality monitors happen to have been placed which can be the difference between passing and failing.

The regulatory environment we have is quite controlled. We have targets set at, for example, the European level and that does not give us much freedom to do other things. ►



So we are looking at it from the perspective of the production of emissions and the source measurement of emissions so we can try and get rid of it at source.

So what can we do about it?

Reduction

There are four main ways we can reduce the emissions from road transport – using passenger cars as an example:

- (1) We can all travel less. Fewer trips, less demand for car travel and a reduction in pollutants;
- (2) Travel by a different mode. Not all trips are equal – a journey on a full bus has a lower per-capita environmental cost than the equivalent number of cars. Walking and cycling are all the better;
- (3) We can clean up our cars. Technology is improving, and electric vehicles are feeling more like a realistic option to millions of drivers.
- (4) We can try to reduce vehicle emissions as they happen. Less idling at stop lines. A more efficient traffic network. Better road surfaces to reduce resistance.

The pathways are clear, but the tools aren't always.

Step forward Cooperative ITS

As any reader of *SMART Highways* will know intimately, Intelligent Transport Systems have long been used to manage our transport systems better. From the provision of real-time travel information to the demand-dependent traffic lights and bus priority, ITS is all about using technology to manage a network. Cooperative ITS (C-ITS) progresses this, with communication – and cooperation – between different system elements. We can

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use C-ITS to better understand the network, to implement plans, and to evaluate outcomes... and to benefit our environment.

Encourage

For example, C-ITS can be used alongside travel demand management to reduce vehicle emissions at source, to incentivise uptake of low-emission alternatives, and even to encourage other forms of travel. Across Europe, the Compass4D project is developing smart, coordinated signals to optimise speed on approach to junctions. These systems provide information to the driver – or to an autonomous vehicle – about how traffic lights will change, and what the most appropriate speed is. This can reduce vehicle emissions by preventing idling and accelerating, particularly when targeted at the worst polluting vehicles.

Smart Parking applications can reduce the wasted mileage associated with searching for a parking space in our urban areas. These technologies can bring immediate benefit to air quality, but also raise an important question – should we be making it easier to park private cars?

The future is very exciting. We've got a big push on electric vehicles and that will be part of the solution. But that will take a while

to bed in. What we have in the near and medium term is the advent of cooperative ITS and this is going to be fantastic for air quality, with vehicles being a much more

active part in the ITS environment. We can use vehicles to influence the environment directly and there are lots of examples of this already happening. We have had trials of GLOSA (Green Light Optimal Speed Advisory, pictured left) to look at how this might influence emissions. We have had trials around monitoring of clean air zones. We have looked at powertrain switching so we can use the traffic management system to switch a hybrid vehicle from its internal combustion engine to its electric motor so we can reduce emissions at source. The important thing is that we have the digital communications infrastructure in place to allow us to design these systems in a way we never have had before and that is what is really exciting about ITS and emissions.

Crucially systems like this – and approaches to intelligent routing, eco-signal priority and smart parking – utilise technology that is available today. Connected vehicles and C-ITS are not 20 years away, they are tangible solutions that can form part of our current transport system – solutions that can help us on the way to our utopian transport future and bring benefits to communities and the environment today. ■

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You can hear from Dave on his and Atkins' work on improving air quality by listening to a Talking Transport Podcast for the ITS World Congress 2018 in Copenhagen at www.smarthighways.net/podcast-playlist or at www.atkinglobal.com/im