From improvements in safety to reduced congestion and lower emissions, autonomous vehicles have huge potential to transform the UK’s roads. But while the shift from science fiction to reality is already well-advanced, it could still be a few years before you can hang up your driving gloves.

Although the technology has been developed, and is currently undergoing trials in four cities selected by the government – Bristol, Coventry, Greenwich and Milton Keynes, there are a number of major issues to address before these driverless vehicles can take to our streets en masse.

Looking at the way the technology within these vehicles will develop gives some insight into the issue (see box). There are six levels of automation, ranging from zero, where the driver is in control of all functions, through to five, where the vehicle is fully autonomous.

**LEVELS OF AUTOMATION**

**LEVEL 0:** The human driver controls all the driving – steering, brakes, acceleration.

**LEVEL 1:** Most functions are controlled by the driver but a specific one, such as steering or braking, can be done automatically by the vehicle’s advanced driver assistance system (ADAS).

**LEVEL 2:** ADAS can control both steering and braking/accelerating under some circumstances but the driver must pay full attention at all times and perform the rest of the driving task.

**LEVEL 3:** An automated driving system can perform all aspects of driving under some circumstances. The human driver must be ready to take back control at any time the automated system requests.

**LEVEL 4:** An automated driving system can perform all driving tasks on suitably maintained roads and the driver does not need to pay attention in these circumstances.

**LEVEL 5:** The automated driving system does all the driving in all circumstances – no human intervention is required.
LEVELLING UP

Currently, the highest level permitted on the UK’s roads is two, where advanced driver assistance systems such as adaptive cruise control, lane keep assist and autonomous emergency braking can support the driver, but he or she is responsible for the driving.

Moving to level three presents some challenges. At this level the vehicle can perform all aspects of the driving, but the driver must be prepared to take back control when required.

As well as issues around determining whether the driver or the vehicle was in control in the event of an accident, the handover process from technology to human is potentially problematic. Issues such as how long the driver would get to take over the vehicle’s controls and in what types of situations this would occur would need to be clarified. For instance, if the handover occurred in trickier driving situations, would the driver be able to respond quickly enough?

As a result, it’s not surprising that there are calls to move straight to level four, which offers greater clarity and potential safety.

LEGAL LIABILITIES

With such a dramatic change in the way vehicles will operate, the right legal framework also needs to be in place. To enable this, the Automated and Electric Vehicles Bill received Royal Assent in July 2018.

As well as giving the green light to improvements in electric charging infrastructure, this also modernises insurance rules to accommodate autonomous vehicles. By enabling insurers to recover costs when technology failure causes an accident, rather than leaving drivers responsible for accidents they couldn’t prevent, insurers will be able to start developing new products for autonomous vehicles.

While this is a major step forward, there are still some issues. In particular, there is uncertainty over whether insurers will have access to data from the vehicle to determine the cause of a crash, including whether the vehicle or driver was ‘at the wheel’. Having this event data is important and will allow liability to be established quickly, speeding up the resolution of a claim.
Insurers will also need to grapple with the different risk profile presented by autonomous vehicles. For instance, with these vehicles reliant on data and connected technology, there is an increased cyber risk.

Similarly, while this technology will ultimately lead to fewer accidents and lower premiums, there will be a transitional phase where there is a mixture of vehicles on the roads. During this, as autonomous vehicles may be involved in accidents, there could be a spike in costs due to the expensive repairs required.

Consumer confusion around the vehicle technology may also need to be taken into account. An October 2018 study by Thatcham Research found that 18% of British motorists think a car marketed as being capable of automatic steering, braking and acceleration allows them ‘to sit back and relax and let the car do the driving’, with 11% of drivers tempted to have a nap while using this technology.

To address this, it’s calling on manufacturers to adopt more standardised controls, symbols and names for these different features. This, combined with driver training and education, should help to avoid unpleasant accidents as this technology is rolled out.
INFRASTRUCTURE ISSUES

Less thorny, but just as taxing are the infrastructure requirements. Autonomous vehicles will need plenty of data to determine how and where they drive.

Presently, this is collected by sensors on the vehicle, which might help it determine when the driver is moving out of a lane or is too close to another car. However, with more data required to facilitate fully autonomous driving, the UK will need more data sharing infrastructure.

Equally, accurate data is essential. Something as simple as a defaced road sign could mean they are misread by an autonomous vehicle. Addressing issues like this will require contributions from governments and vehicle manufacturers, requiring more intelligent systems that are less open to misinterpretation.

Similarly, in the transition phase where a mixed pool of vehicles are on the UK’s roads, it may be necessary to have separate lanes, or even roads, for driverless cars. Making provision for this could be tricky.

With so many issues still to address, be prepared for a long wait for your first autonomous vehicle. The World Economic Forum doesn’t expect them to be commercially available in the UK until 2025, with the whole UK transportation system fully automated by 2070.

ETHICAL CONSIDERATIONS

There are also moral issues to consider before these vehicles can be given the green light to drive on the UK’s roads. In particular, where a self-driving car is in a situation where a crash is unavoidable, and there are potential fatalities, how does it determine who should die?

It’s a poser that researchers from the MIT Media Lab have set out to answer through its Moral Machine. It presented a number of moral dilemmas, asking people to choose whether a self-driving car should sacrifice its passengers or hit a variety of different pedestrians such as a successful business person, a known criminal, elderly people, a herd of cows and so on.

While its results show that overall people prefer to have the smallest possible number of fatalities and would save humans over animals, there is no right or wrong answer. Manufacturers – and governments – will need to factor this into their thinking.
TIME FOR CHANGE

But this timeframe isn’t quite as negative as it may appear. Over the next five or so years, autonomous vehicles are likely to make an appearance, albeit in a more limited way. This could include more use in the commercial space, for example, platoons of trucks and public transport, or in more restricted areas, such as on college campuses or at airports.

This more relaxed introduction may also suit motorists better. Anyone who’s switched from a manual to an automatic car is well aware of the adjustments required: these are magnified in the shift from a vehicle at level one automation to one at level four or five.

What’s more, over the transition period, the advanced driver assistance systems that are only seen in top-end models will trickle down to the mass market, helping to improve safety. For instance, autonomous emergency braking is now widely available, with Thatcham Research estimating that it will help to save 1,100 lives and 122,860 casualties in the UK over the next 10 years.

Although it may be many years before autonomous vehicles replace more conventional motor cars on our roads, the drive to this form of technology will have safety and insurance benefits long before.