City transport needs saving from itself – here's how to do it

August 7 2015, by Yvonne Huebner

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Cities are growing rapidly. According to UN estimates, the world's urban population grows by two people every second, 7,200 every hour. This means that within two decades, nearly 60% of the world's population – five billion people – will be city dwellers. In Europe, this figure is already higher – four out of five people (80%) live in cities.

Rapid urbanisation comes with a series of challenges and opportunities

for cities. For example, urban areas are responsible for 70% of greenhouse gas emissions and consume three-quarters of the world's resources. But there are ways cities can address these and other challenges in an integrated way providing safety, security, good quality of life and environmental sustainability.

To do this we must make cities "smart", by using computer systems and the internet to better balance demand for things like energy, transport and waste management with secure and reliable supply. This will increase the resilience of our infrastructure to both man-made and natural disasters, and reduces cities' ecological footprint.

Cars as batteries

Already cities are electrifying their mobility services, with electric cars gaining popularity alongside the electrification of rail networks, trams and bus routes. This reduces transport emissions – a major cause of air pollution in cities, but which also has an impact on the grid. The challenge is to integrate them.

Some smart phone apps already do this in a way, allowing drivers to schedule the charging of their electric vehicles (EVs) at night when electricity is cheaper. But through smart grid technologies, cities are moving towards dynamic demand responsive charging, where EVs are automatically charged at times when electricity demand is lowest or when excess renewable energy is available. Smart grids can match charging patterns to the intermittency of renewables such as wind and solar.

Ultimately, EVs could be used as a back-up power supply for our homes during peak times or in emergencies. What's more, old EV batteries could be reused as back-up to meet short-term peak demand in other systems – for example anaerobic digesters (which break down organic

waste to produce biogas) or other energy technologies that otherwise would require costly upgrades to connect to the grid.

Many cities are grid-locked and are struggling to address congestion on their roads and rail networks. To increase capacity, we have a choice between expanding our existing infrastructure, or to use it more intelligently. Instead of infrastructure upgrades that take decades to plan, smart cities use high-speed internet access and sensors to inform, manage, and nudge individuals and freight operators to optimise their journeys.

A trial from the EU-funded Compass4D project equipped key routes in seven EU cities with intelligent traffic lights that provide speed advice to drivers that cross them. This allows the drivers to receive information on a sat nav on how fast to drive in order to get through a series of green traffic lights. It reduces fuel consumption and helps the driver adopt an eco-driving style, reducing emissions in congested urban areas. Early results from the trial show that the use of Compass4D yielded improvements in average journey times, speeds, time spent stationary and power consumption.

Smarter traffic control

The same technology can be used to give priority at intersections for certain vehicle types, such as emergency vehicles to allow them to reach an incident more quickly. Similarly, delayed buses could be given priority at smart intersections, making public transport more reliable and attractive to commuters. Estimates have shown that implementing this technology along all bus priority routes in the northeast of England (approximately 65km of road) would cost the same as laying 200 metres of new asphalt.

Ultimately, this technology could be used to better manage the

movement of freight vehicles within urban areas. Trucks could be platooned together and drive autonomously in a convoy or they could be given priority on roads designated as freight corridors, making logistics operations both more energy efficient and reliable.

There are a wide variety of benefits to smart cities but to take full advantage of them they need to be tested at scale and within different contexts as not all cities are the same. They require thinking differently about how we live in cities and improving our understanding of the interaction between cities' energy, water, transport, waste and digital control systems.

Smart cities are not without risks. The scale and complexity of these urban networks coupled with their ever growing interdependencies could also potentially increase vulnerabilities to climate change and terrorist threats. But the opportunities for managing cities in a more efficient and cost-effective manner are simply too great to not be taken up.

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