



# ICE East Midlands Chair's Programme: Liveable Cities

**Matt Huddleston**

**ICE East Midlands Regional Chair 2018-19**



## FOREWORD by Matt Huddleston

### ICE East Midlands Regional Chair, 2018-19

During my year as ICE East Midlands Chair (2018-19), I delivered a programme of events to focus on and draw debate on the need for the UK to reach its 2050 greenhouse gas (GHG) emissions target. The programme specifically considered the demographic and urbanisation challenges this raises for our communities in the East Midlands. Cities across our region are growing and we asked; how can the needs of these increasing urban populations be sustained whilst transitioning to sources of low carbon energy?

I wanted the programme 'Liveable Cities' to highlight how sustainable and low carbon solutions can be developed in order to overcome the challenges facing cities in the East Midlands. It is no surprise that cities consume the majority of energy resources and generate the majority of carbon dioxide emissions.

So, what exactly is a liveable city? The answer to this question will be slightly different depending on whom you ask and dependent on what city you are referring to. There is no one-size-fits-all solution to creating liveable places

and communities. The challenge to provide affordable homes and services, accessibility for all ages and ability, connected transport for a growing urban population whilst reducing GHG emissions is overwhelming.

However, a vision of blue and green infrastructure connecting new eco homes which are connected by fleets of electrical vehicles, both powered by locally produced renewable energy, is becoming reality in some parts of the region.

The bigger problem, given the number of new homes built, is how we manage our existing, aging infrastructure and housing stock which carry a heavy demand on fossil fuels and produce increasing levels of heat. Many houses are also at risk to flooding and it is an overwhelming majority of the socially vulnerable who find their homes at risk of climatic events. An investment in retrofitting domestic and commercial buildings is necessary in order to meet the legally binding 2050 target and enhance resilience in our communities.



## Government and Policy

In June 2018, a report from the Committee on Climate Change stated that the UK Government is not on track to meet its carbon emissions reduction target by 2050. A year on, and the target changed to net-zero greenhouse gas (GHG) emissions by 2050 to balance reduction and production of those harder to avoid. The development of low-carbon Infrastructure, especially in land transportation that is powered by renewable forms of energy, is essential to achieve a net zero GHG economy by 2050.

Governance and engineering solutions need to be aligned in order to accommodate urban migration, whilst infrastructure and planning priorities should reflect the needs of the cities and surrounding areas. Understanding how our spaces and places function, no doubt can inform better decision-making and help create healthy

cities in the long-term. This should be achieved by collaboration and engagement across all sectors, with built environment professionals working closely with the communities in question. If the aspirations of the communities are met, then there is a chance the solutions through inclusive design and planning, will be successful.

Building effective relationships are critical to identifying the different forms of environmental, social, economic and political value. These cross cutting interventions to address the urbanisation and demographic challenges need to be resilient, adaptable and capture the different forms of value. The design of healthy and liveable environments relies on the delivery of physical infrastructure that promotes healthy communities.



## Energy

Low carbon renewable energy produced near cities is necessary for decarbonisation and to support this, gas needs to be phased out. Provision of heat is currently a significant contributor to UK emissions and demand is increasing with rapid urbanisation. Shocks and stresses such as air and water pollution, extreme heat, flood and drought risk and food security are increasingly common with a warming planet. The domestic housing stock must look at alternatives to gas, but currently makes little use of low carbon alternatives. New homes built from 2025 will no longer use gas heating but will be replaced by low-carbon heating systems, marking the beginning of the end of the fossil fuel era.

An alternative to traditional fossil fuel gas is biomethane hydrogen gas, better known as bio-gas. This can be supplied through the current grid-based gas systems, infrastructure which would otherwise become redundant. If hydrogen does replace gas, its production will need to be supported by methods of carbon capture and storage trapping at the emission source. The favoured method of producing hydrogen without releasing carbon dioxide, is

through the electrolysis of water, which uses electricity of renewable origin such as solar or wind. Importing liquid hydrogen is also possible and certainly may prove important in the future provision of electrical transport without straining the grid. However, transitioning from gas to hydrogen based liquid gas will be very costly and has financial and infrastructure systems implications.

The self-sustaining city of the future will need to be powered by renewable hybrid electrical and heat generation systems; the benefit of a hybrid system is its resilience to climate events, reducing disruption to supply and potential black outs and risk to our heavily dependent information and communications technology (ICT) sector. To reduce the growing risk of utility failure from extreme weather events, decentralisation and local production of renewable energy offers improved resilience. Capacity of the existing grid systems remains an issue and a reduction in demand is essential to sustaining supply. Both electrical heating and electric vehicle technology has risk implications on capacity and seasonal storage for captured carbon is important in order to meet demand.



## Transport

The future of mobility in cities will rely on intelligent transport systems that operate within green infrastructure corridors, but for intelligent mobility solutions to succeed, outputs need to be safe, efficient and sustainable. This will require accessible and integrated modes of transport and links between rural and urban modes, such as; flexible on demand buses, electric bikes or autonomous vehicle pods.

However, the journey will need to be more attractive than using the car in order to change behavioral patterns, by giving people a better choice to get out of cars willingly. In the liveable city, walking is recognised as a transport mode in its own right. Creating safe and efficient transportation systems, as well as a sense of place and community, will go to help to make walking a normal part of everyday life and the natural choice for shorter journeys.

Road transport is the biggest contributor to GHG emissions worldwide. By removing, or pricing out, privately owned motor cars and replacing those with non-emitting autonomous vehicles, a considerable number of benefits can be achieved.

Not only will autonomous vehicles reduce congestion and emissions, but they will also provide benefits to health and wellbeing such as increasing free time, improving mobility for the elderly and disabled for example, allowing cities to re-shape more liveable spaces and breathing high-quality air, data shows that air pollution is the number one environmental cause of an early death.

The development of CAV (Connected and Autonomous Vehicle) and EV (Electric Vehicle) technology drives require complementary high-quality digital and physical infrastructure to succeed. Connected technology development primarily aims to improve transport efficiency and needs to come before autonomous technology which aims to improve transport safety.

There are three infrastructure barriers holding the UK back from CAV readiness:

- Global connectivity;
- 4G/5G coverage;
- Road quality;



## Transport - continued

New infrastructure systems need to be integrated with existing infrastructure systems and address demographic and urbanisation challenges. But these business models for change must support transport modes which are interconnected with seamless routes of public transportation.

Transport infrastructure networks in urban centres should be supported by an efficient and integrated regional transport network extending to rural communities. Maintenance regimes of existing transport and utility infrastructure should, where necessary, include adaptation and mitigation works to create a resilient network against the threat of extreme climate related events. The rural road network has evolved over

many years and presents issues due to its varied condition and susceptibility to extreme weather events. The majority of roads and traffic miles per year are done on these rural roads, yet CAV developers and industry continue to focus on city and urban applications.

There is also a need for a robust communications network to operate connected and autonomous vehicles efficiently and effectively, but rural areas will remain a challenge in adopting CAV technology. To provide 5G or even 4G to coverage to all rural areas in the UK will be very costly, not to mention hugely intensive infrastructure wise.



## Conclusion

People are the heart of the city and the city should be engineered around people. The aim should be to deliver individual, society and planetary wellbeing. As populations increase in size and as more people move into cities, there is clustering of the socially vulnerable to flooding hazards, demonstrating a strong need to build climate change resilience into new communities and mitigate risk in existing areas by retrofitting infrastructure.

New homes should be built around green infrastructure to reduce risk of flooding and incorporate sustainable drainage systems; periods of heavy rain put pressure on drainage systems increasing the risk of flooding as we have seen recently across the region.

Our infrastructure needs to not only be liveable, but also sustainable and resilient to withstand pressure from increasing demand. These are the vital components for creating Liveable cities in the East Midlands. However, there is no simple solution to meeting climate change targets. Switching to renewable sources; reducing demand; encouraging people to change their behaviour; will not on their own, meet the GHG emissions reductions that are needed.

As Local Authorities across the region form their local transport strategies for a growing population, there is sure to be a greater focus on sustainable transport and improved levels of choice, with greater emphasis on improving the places we live and reducing our impact on the climate.



## Nottingham's efforts to meet climate change goals - a case study

Nottingham City Council (NCC) has embarked on considerable climate change effort and made a commitment to meet their aspirational goal: to reduce greenhouse gas emissions and become carbon neutral by 2028. Low carbon and renewable energy solutions are at the centre of establishing the City and surrounding neighbourhoods as healthy places to live.

NCC is developing a range of initiatives to see their commitment continue to hit the required trajectory. The council is establishing zero and low carbon heating for housing; developing district heating schemes which extend to transport and mobility; extending the City's bus fleet to electric powered vehicles, and doubling the price of car parking in city centre to manage demand. The council recognises that getting people on bikes and on buses and out of cars is the most effective solution to carbon reduction.

One current standout project is the European-funded CleanMobilEnergy initiative, which involves many partners across north-west Europe. The City Pilot began in September 2017 and runs until March 2021 with the aim of developing Smart Energy Management System, integrating Renewable Energy and Electric Vehicles.

At Eastcroft Depot the council is looking at various clean energy systems and Vehicle to Grid (V2G) technologies to support regional Electric Vehicle (EV) rollouts. Over the lifetime of the Project it will seek to install:

- 40 battery electric V2G compatible vans and cars;
- Up to 40 V2G bi-directional units to enable the vehicles to be used for energy storage and grid balancing;
- A minimum of 88kW of solar photovoltaics;
- A 378kW/676kWh lithium-ion battery;
- A purpose built 'Interoperable Energy Management System' to control energy flows.

These substantial upgrades to Eastcroft Depot are due to commence in 2020 and will improve the electric vehicle infrastructure and future proof the depot. The refurbishments will maximise the production and use of local clean energy, help reduce greenhouse gas emissions and costs associated with charging electric fleet vehicles.

T: **+44 (0)121 227 5949**  
E: **[ice.eastmidlands@ice.org.uk](mailto:ice.eastmidlands@ice.org.uk)**  
W: **[ice.org.uk/eastmidlands](http://ice.org.uk/eastmidlands)**

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