November 2017 Edition
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creating sustainable cities

an Ibex Earth initiative

CREATING SUSTAINABLE CITIES JOURNAL

With contributions from:

Forum for the Future
University of Portsmouth
Ashden
Innovate UK
10:10
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Galapagos Conservation Trust

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CHRIS LIVEMORE
Creating Sustainable Cities Journal

The future of the UK's Urban Landscapes must be Sustainable

With climate change set to become the defining issue of the 21st century we must ensure that the UK's urban landscapes are equipped to adapt and minimse the future risk and impact on local communities. Cities constantly change because we do - our next urban evolution must embed sustainability at its core.

Our second edition of the Creating Sustainable Cities Journal focuses on how the UK's cities and towns can build climate resilience across their regions - reducing carbon dioxide emissions and building smarter energy systems in the process.

Firstly, we have to accept that we will not address climate change without transforming the way that we generate, store and use energy, or deliver new approaches to ensure that our urban landscapes can cope with and manage the more extremes of future weather events.

Let us start with decarbonising the energy sector. In theory the solution is incredibly simple - we stop burning fossil fuels.

In reality this is a difficult challenge with many hurdles to overcome. Oil and gas have powered modern life since the Industrial Revolution - how many people would be prepared to put their lives on hold whilst we find and implement alternative solutions?

Instead we need to be looking at ways of improving efficiency - two thirds of the energy that we use to provide electricity in the UK is lost during its generation or transportation via our energy networks. Households also lose a lot of heat through poor insulation.

We can explore smarter energy systems, deliver more localised solutions and replace fossil fuels with alternatives, using power from wind, solar and other renewable sources. We can also facilitate the deployment electric and on-demand vehicles, deliver smarter public transport and increase the number of cyclists on our roads

At the same time these technologies are becoming more affordable, increasing the likelihood of creating a large network of energy 'prosumers' - those who produce more energy than they consume - particularly given recent advances in battery storage. This alone will spark a huge transformation across our entire energy sector.

New technologies and sustainable innovations will undoubtedly better our lives. Yet, it is up to our cities and towns to find ways to accelerate their uptake. It is up to our cities and towns to ensure that our urban landscapes can deploy climate mitigation and adaptation measures. And it is up to our cities and towns to create sustainable urban environments.

We hope that you enjoy the second edition of the Creating Sustainable Cities Journal and would like to thank those who have contributed articles for our growing network.

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MARTIN HUNT
Forum for the Future

A landscape of opportunity

- what today's rapidly transforming energy system could mean for our cities

Our energy system is changing faster and more fundamentally than at any time since the Industrial Revolution. Earlier this year, coal - the dirty kick-starter of our industrialised economy - was given the death knoll across Europe, just a few months before the price of offshore wind fell below nuclear and gas for the first time. The continued drop in renewable energy costs now mean the sector is approaching the point where it needs no subsidies.

On the ground, over 900,000 UK homes, communities and businesses are generating their own power from decentralised micro-power systems, representing an astonishing 12,000% increase on March 2010. On our roads there are 122,000 vehicles powered solely or in part by electricity - less than 2% of the 9 million electric and hybrid electric vehicles anticipated by 2030 .

At the same time, advances in digital technology are empowering businesses to manage their energy use like never before, while intensive R&D into energy storage means cost-effective solutions are beginning to appear. Initiatives such as OVO Energy and Nissan's collaboration to speed up the adoption of home battery storage certainly point at things to come.

The big shift in 2017 was for this transition to be led by the pure market forces rather than government policy. Whilst the 2015 UN Paris Agreement and the recent UK Clean Growth Strategy have galvanised action, they are only accelerants of an unstoppable transition.

> "The continued drop in renewable energy costs now mean the sector is approaching the point where it needs no subsidies.

The key question for the climate is whether this will be enough to curb emissions to such an extent as to limit global warming to 2°C, or tougher still 1.5°C, this century.

How is the system changing?

In August, Forum for the Future (Forum) and Friends Provident Foundation (FPF) released the Wise Minds report, based on in-depth discussions with six ex-industry leaders and extensive desktop research. It highlighted four trends that are central to the change in how we generate and manage energy across the UK. We call them the 4Ds:

Decentralisation: Like many areas of the world, the UK is witnessing a clear trend towards distributed power generation, from massive offshore windfarms to domestic rooftop solar.

Digitisation: Digital innovations, from smart meters and blockchain to big data algorithms, are enabling a shift towards user-led control of energy and the exploration of local flexible energy markets.

Democratisation: The decentralisation of power generation offers households, businesses and communities the opportunity to invest, co-own, manage and profit from renewable energy installations.

Decarbonisation: Energy economics have swung rapidly in favour of zero-carbon technologies, making the shift towards renewables unstoppable.

So, what's driving the change?

Our analysis concluded that there are three principal drivers of change behind these trends:

1. The rapidly improving economics of renewable power, supported by the growing prospect of cost-effective energy storage and the emergence of electric vehicles
2. The digital revolution
3. Energy policy

These are driving strong winds that are under-mining the once-stable business models of the 'Big 6' energy suppliers and the grid owners. They are also opening up opportunities for new actors – community groups, everyday businesses, public sector organisations – to get in on the action and be energy companies themselves. What was the domain of dreamers just 15 years ago now rapidly becoming mainstream.

In the Wise Minds report, the experts warned the incumbents to change now or face a very uncertain future, one where they could well lose out to more nimble innovators. Then in October, a further report by InfluenceMap and FPF lifted the lid on how these energy giants are to a greater or lesser extent using their influence with government to shape policy changes to suit their current interests. For instance, acting against localised renewable electricity generation that threatens their cen-tralised large-scale power stations. This may be alarming but the Wise Minds' view was that the revolution cannot be reversed, it can only be slowed down or sped up.

What do the opportunities look like?

Amid this sea of change, there are opportunities aplenty for savvy businesses and other organisations that understand what the reshaping of the energy market might mean for urban infrastructure and business models.

At Forum, we have been focussing our efforts in two particular areas (i) Living Grid; and (ii) Community Energy Asset Bank.

Living Grid

Until recently, corporate energy users were restricted to playing an isolated, passive role in the energy system because it was impossible to communicate with energy providers in real time. But all that has changed thanks to the rapid emergence of digital technologies that are enabling companies to have far greater flexibility over how they use, generate and store electricity.

The Living Grid was set up in 2015 by Forum and leading businesses to capitalise on the opportunities presented by digitisation for large energy users and the UK as a whole. The 'living' part is key as we draw inspiration from the best of nature.

Think about how the ecosystem of plants in a forest is super-efficient at using available sunlight despite it changing second by second, and endures through storms and cold periods. It needs no fossil fuels, instead storing surplus energy and slowing growth when it is scarce. Our energy systems can do the same, and pioneers in the Living Grid are showing the way.

Key to the Living Grid is for the members to automatically power down energy-intensive processes when signals from the grid say that demand for power is about to exceed supply from renewables.

All this is done without interrupting functionality and can be overridden. This system reduces the need for expensive, polluting gas and diesel-fired power stations, thus saving carbon and money, which is shared with the organisation. This together with energy storage devices mean that organisations can now be active players in creating a more resilient, affordable system that can take on more renewables – whether their own or not – than ever before.

The carbon savings alone will be very significant. Aggregate Industries has been developing and installing dynamic demand technology on its bitumen tanks and pumps, turning them into smart devices that adjust their electricity demand according to fluctuations in grid system frequency. It's expected to free up to 5MW of flexible capacity for the National Grid by 2020, equating to 11,380 tonnes of annual carbon savings.

And this is only just the start of the story. Nicola Shaw, Executive Director at National Grid, asserted in 2016 that up to 50% of demand could be "time shifted", enabling much more wind and solar sources of power onto the grid than ever believed possible.

Next Steps:

Following a successful media launch, the Living Grid's immediate goal now is to achieve a critical mass of 50 organisations – representing a combined flexible capacity of 1GW (2% of UK peak electricity demand) – to bring this new future to life.

That's why we're inviting large energy users, suppliers of clean energy solutions and others to help us really build an exciting shared vision of a Living Grid for the UK.

Together we want to show how the efforts of individual organisations can contribute to the transformation of the wider energy network – building an integrated, demand-led system that works in harmony with renewable sources of energy and improves its overall operational efficiency.

www.livinggrid.net

Community Energy Asset Bank

Today there are some 220 community energy organisations across England, Wales and Northern Ireland made up of 30,000 members and producing 21MW energy capacity - that's enough to power 85,000 homes and reduce emissions by 110,000 tonnes/CO_2 .

This movement of local cooperatives and social enterprises is providing an investment platform for wider change within these communities, supporting anything from fuel poverty alleviation and community gardening to apprenticeships and skills development.

But this is just the beginning.

We believe that the community energy movement has the potential to grow exponentially. The increasing sophistication and creativity of community energy groups like Low Carbon Hub and Repowering London is providing a clear direction of travel, whilst new business models are constantly emerging to adapt to the shifting government policies and market conditions. Perhaps most importantly, the public's appetite to invest in local community energy schemes is high, and rising further still.

However, one of the key barriers inhibiting the sector's growth progress is the time and effort it takes to find and secure suitable sites to host community owned renewable projects. This is partly because owners of viable buildings and under-utilised land either don't realise the value of the assets they're sitting on or don't know how to find a trusted community organisation to partner with.

Community energy match-making:

To help catalyse the next wave of community energy projects, Forum is in the process of creating a Community Energy Asset Bank. Using seed funding from Friends Provident Foundation, we plan to develop a trusted nationwide service which matches owners of viable land and buildings with community energy groups who have the ability to deliver renewable energy projects with them.

From care homes to churches, from business parks to hospitals, from shopping centres to commercial offices – our vision is of a large, diverse and exciting mix of asset owners partnering with community groups, to accelerate the shared benefits that are unique to community energy with a completely new pipeline of projects.

Regional piloting of a prototype will begin this winter and we are now looking to recruit businesses, local authorities and other public agencies to actively support the project by exploring the hosting of community renewables on their assets, providing match funding or communicating our work through their own networks.

ABOUT THE AUTHOR

Martin Hunt is a Principal Project Manager within Forum's Create team, overseeing a portfolio of projects contributing to the transformation of our energy system.

If you would like to discuss the opportunities to be involved in either Living Grid or the Community Energy Asset Bank then please email:

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STEFFEN LEHMANN
University of Portsmouth

Regenerating the UK's post-industrial cities

Cities are never finished objects, but always in transformation. Urbanisation is one of the defining processes of contemporary times and a paradigm shift in urban thinking is now happening in the UK, where cities become regenerated urban laboratories. This new paradigm highlights participatory planning processes and new ways of greening and re-naturing cities, combined with building socially-inclusive public space. It is time to rethink and regenerate cities for the age of global warming.

However, the complex challenges posed by urbanisation and development cannot be solved by one discipline in isolation. This is why we established the interdisciplinary Innovation Cluster for Sustainable Cities at the University of Portsmouth to bring together key experts from a wide range of disciplines.

Cities in the UK and in other countries are facing huge challenges and one answer to regeneration lies in closer collaboration between city leaders, industry and communities with universities.

Most of the time, UK cities do not need spectacular change or short-term vanity projects, but instead require more modest and careful step-by-step regeneration strategies that get the best out of what we already have and deliver long-term societal benefits.

There are plenty of obstacles in this complex process, funding is limited and the public policy side is not always supportive of urban transformation and regeneration. Most urban policies in the UK are now over 15 years old, meaning they were formulated pre-climate change impact awareness and are often ill-informed or out-dated.

Today, we know much more about the causes of urban decline, have new models of urbanisation and can collect the required reliable data that is required for better decision making. This means that there is now a need to update policies on this new, integrated and evidence-based urban understanding. As Badiou put it, "change is the law of the world; the absence of change is death. When we think, we think change" (in: Introduction to the Philosophical Concept of Change, 2012).

> It is time to rethink and regenerate cities for the age of global warming.

To achieve all this, our collaborative networks and partnerships are crucial, including closer collaboration between all levels of government, communities, the private sector and academia, to enable interconnected peer-to-peer learning networks and better information and knowledge sharing. Architects are slowly regaining their interest in urbanism and strategic urban thinking about future neighbourhoods and what the city might look and feel like.

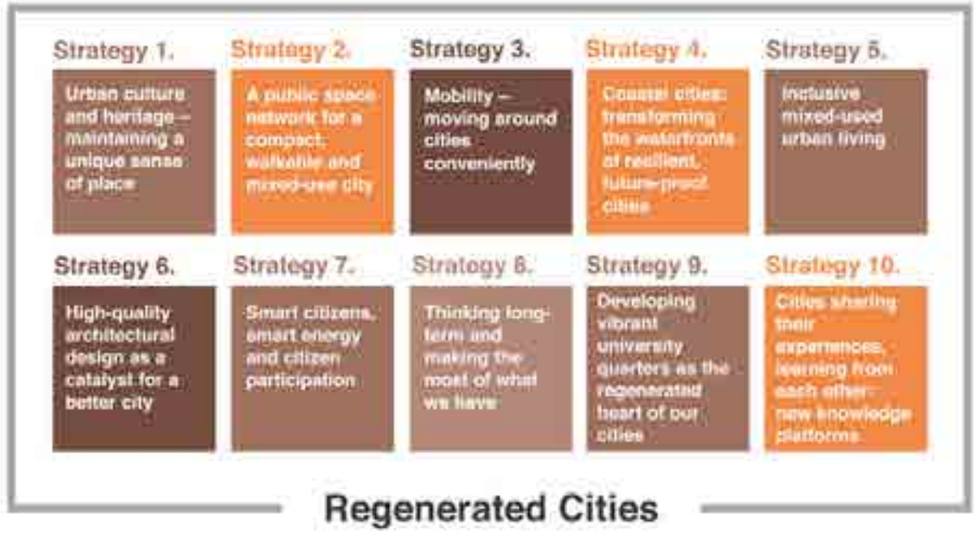
The Cluster for Sustainable Cities is an active interdisciplinary research group that brings together 38 key researchers in the field of cities from across a range of disciplines. The Cluster has recently organised three highly successful breakfast events on 'Our urban futures', inviting around 120 to 150 participants and decision makers to engage in public dialogue, co-creation and debate, discussing visionary but grounded ideas for the future of cities in the UK. Part of this dialogue were discussions such as cities' continuing transformation to service and knowledge-based cities, with anchor universities sometimes driving this regeneration by building 'Innovation Quarters'; there are particularly exciting examples in UK cities where new university quarters have been developed that delivered public benefits and new spaces to be enjoyed by the whole population.

Clearly, it's critical to explain the reasons for change well and to inform (educate) the public in good urban design, but what is often missing is an agreed basis to start from.

To this aim, the Cluster has partnered with industry and local government (such as Brighton and Hove City Council; Southend-on-Sea Borough Council and Arup) to create the visionary document: 'Transformation towards Sustainable and Resilient Communities', a booklet that introduces ten optimistic, high-level guiding strategies as principles of good urbanism which we think will offer a solid basis for any urban regeneration project.

Transformation towards Sustainable and Resilient Communities'

What are the ten strategies that need to be delivered tackled simultaneously in order to create sustainable and resilient communities? Steffen Lehmann explains below:



Strategy 1. Urban culture and heritage – maintaining a unique sense of place

Linking the continuous transformation to the city's past and sense of place, as a shared and refined urban vision creates cultures of the people, ecology and place expressed at a human scale through both physical and social structures.

Strategy 2. A public space network for a compact, walkable and mixed-use city

Creating calm, walkable streetscapes and connected public spaces to support walking, social interaction and display distinctive private, commercial and civil functions.

Strategy 3. Mobility – moving around cities conveniently

Making transportation more equitable and identifying new region-wide, low-carbon, mobility concepts that are not car based.

Strategy 4. Coastal cities: transforming the waterfront of resilient, future-proof cities

Strategically planning ahead, allowing the city to become more adaptable and anticipate demands and impacts to ensure future infrastructure and waterfronts are resilient.

Strategy 5. Inclusive mixed-used urban living

A diverse, accessible, affordable and active city will encourage successful commercial activity, promote prosperity and support the well-being of inhabitants including the ageing population.

Strategy 6. High-quality architectural design as a catalyst for a better city

Architecture has to be more than individual acts: it has to provide a coherent background. Including the reuse and up-cycling of existing buildings and structures, and the careful increase in urban density will help to make the city more authentic and sustainable.

Strategy 7. Smart citizens, smart energy and citizen participation

Smart, citizen-centric planning will use urban performance data for better informed decision-making and new policy formulation.

Strategy 8. Thinking long-term and making the most of what we have

Taking full advantage of the existing and making the most of what we have, while creating 'Spaces of Opportunity' to sustainably strengthen the city and repair its discontinuities.

Strategy 9. Developing vibrant university quarters to regenerate the heart of our cities

Re-imagining a regenerated city centre that is less car dominated, with a network of walkable public space and meeting places, with a world class university quarter at its centre.

Strategy 10. Cities sharing their experiences, learning from each other: new knowledge platforms

Participatory and people-centred urban governance with people-centred planning that will further improve the liveability and competitiveness of our cities by encouraging practices to make them more just, safe, healthy and resilient.

No doubt, cities in the UK are facing huge challenges. With these ten strategies in hand we have now a commonly agreed basis to work from and can together consider what actions can be taken in the future regeneration of our cities.

Please join us on this journey.

ABOUT THE AUTHOR

Dr Steffen Lehmann, AADip, RIBA, AoU, is Professor of Sustainable Architecture and Founding Director of the Cluster for Sustainable Cities at the University of Portsmouth.

For more information and to download the full Urban Manifesto, please visit:

www.city-futures.org.uk

CLUSTER FOR SUSTAINABLE CITIES

FAYE SCOTT
Ashden

Connecting the dots city leaders and sustainability

Devolving power to cities is a hotly debated topic in economic, housing and transport circles, but less so in sustainability ones. This needs to change. Devolution is economically driven and from that perspective, low carbon sectors are clear opportunities with multiple benefits for cities, such as job creation, clean energy and reduced pollution.

New mayors like Steve Rotheram in Liverpool City Region recognise this, capitalising on a local wind farm extension to reiterate his commitment to securing the business and low carbon opportunities it represents.

More fundamentally, capturing the economic benefits of devolution requires cities to offer the quality of life that will attract businesses, investment and new residents. This includes being easy to get around, having clean air and energy, high quality, warm homes, commercial and public buildings, and well maintained green infrastructure. Many of the things city dwellers want are actually environmental goods. Delivering them will require city leaders to tackle issues that are more traditionally seen as green ones, such as energy efficiency, air pollution, sustainable transport and resilience to climate change.

Therein lies the big opportunity of devolution – the chance to embed sustainable objectives across policy and delivery at the city level. National policy separates issues, scattering interconnected ones across different departments. This makes it very hard to identify the cross-cutting benefits of policy ideas, let alone to advocate for progress on the back of them. Cities and their leaders can break out of these silos and build sustainability into their workings of their city. Not because 'being green' is the right thing to do but because it helps them tackle perennial challenges, like fuel poverty caused by cold and damp homes, a health crisis caused by air pollution, and congestion caused by over-reliance on cars and poor public transport.

"Therein lies the big opportunity of devolution – the chance to embed sustainable objectives across policy and delivery at the city level.

Leaders need to see these opportunities in order to act on them. It's possible to 'improve' transport in a way that merely heightens car dependency and pollution. Inefficient new homes that are unprotected from energy price shocks can get built. And existing homes and their occupants can remain cold and suffering the impacts of fuel poverty through inaction.

A great deal is being done in local authorities, combined authorities and LEPs around the country to raise sustainability up the agenda. Ambitious targets and projects are underway in many places, but this is not the case everywhere. Sometimes it takes political pressure, which many leaders are feeling on air quality, or business opportunity, as many see in low carbon. And sometimes it is simply inspiration, when decision makers see what futures are possible.

Ashden winners demonstrate these futures every day and are already making progress on the ground. Supporting communities in retrofitting homes and reducing health problems in the process, getting people out of cars and onto bikes, incentivising public travel and installing community energy or helping businesses make common sense energy savings. But all of their work has the potential to be scaled up and to have much greater impact at the city level.

National policy is doing little to enable or accelerate that scaling up. Sustainability standards for new build have been radically pruned, a newly stated target for energy efficiency retrofit is welcome but lacks a policy programme to back it up, and a reluctant air quality strategy is regarded by many cities as inadequate to the scale of the problem.

City leaders – a new frontier

So Ashden and others are looking to city leaders to take matters into their own hands. In particular, the election of six city region metro mayors in May 2017 created a new cadre of leaders who join the ranks of influential mayors around the world.

It's always risky to see new leaders as the solution to old problems, but it is clear that the mayors want to carve out meaningful progress in their cities and have real potential to galvanise progress on whatever issue they turn their attention to. Ensuring that their glance falls and stays fixed on sustainability is essential, as the flurry of first 100 days activity settles into longer-term priorities.

Ashden will be working with the city regions to share the experience of our award winners and to demonstrate what is possible at the city scale. We aim to engage metro mayors and help identify opportunities for scaling up or replicating progress.

Andy Burnham in Greater Manchester and Steve Rotheram in Liverpool City Region have already made their commitment to sustainability for their city regions clear, as has Sadiq Khan in London, who should be seen alongside the new metro mayors. But there is more that they and their fellow mayors can do.

Key tools at their disposal include the remit which most of them have to develop a spatial plan for their city region. This will indicate locations for housing but can go much further.

The London Plan set expectations for the quality and energy performance of new build that go beyond what national regulations require. We encourage city region mayors to do the same with their spatial plans, building in a strategic commitment to sustainable, warm, affordable and future proof homes that will last generations.

Transport is an area in which mayors have the most direct powers and many of them will develop strategic transport plans. These will look at transport within and between city regions. The aim will be to improve and better integrate public transport offers, including walking and cycling infrastructure, congestion busting measures and smart ticketing.

Transport for London and Transport for Greater Manchester's ability to offer integrated transport options and to promote modal shift, along with a strong focus on tackling air quality and reducing emissions are models for city regions to aspire to.

> "Mayors want to carve out meaningful progress in their cities and have real potential to galvanise progress.

The big and the small

A lot of debate about devolution focuses on high profile projects like HS2 or Crossrail for the North and linking city regions to each other better. Environmentally there is often a large scale focus as well, on projects like new wind arrays or repurposed manufacturing facilities offering green jobs. These are vital to rebalancing the UK economy, and they also give city leaders profile and tangible success to point to.

But the lived experience of our cities, the day to day, the clean air outside a primary school, the ease of walking to local shops and better quality homes to buy and rent are where sustainability matters the most and where relatively small changes can make a huge difference. We hope that mayors use the power they gain from delivering the big, and the once in a generation. to create a sustainable day to day for generations to come.

ABOUT THE AUTHOR

Faye Scott is the UK Research and Policy Manager at Ashden, one of the world's leading NGO's operating within the field of sustainable energy and development.

You can find out more about Faye's work by visiting: www.ashden.org

Case Study: Tackling congestion and investing in change – Nottingham City Council

Along with most UK cities, Nottingham suffers an air quality crisis and congestion and knew that intervention was needed. In 2011 the city council introduced a Workplace Parking Levy (WPL). It is only the second city in the world to do so and won the Ashden Clean Air Award in 2017 for their work.

An annual charge is applied to all workplace parking, with exceptions such as emergency services and NHS premises. A business can choose whether to pass the charge fully or partially onto its employees, as well as considering a reduction in the number of parking spaces.

The WPL's revenue is ring fenced for use on public transport measures and has partially subsidised the purchase of electric buses and the construction of charging infrastructure, contributed to the redevelopment of Nottingham train station and leveraged funding for larger projects such as the £570 million tram extension, real-time bus information, refurbishments, cycling facilities and smart ticketing.

Workplace travel plans and grants to employers for workplace cycle facilities such as showers and lockers have also been funded by the WPL.

DR JAMES TAPLIN
Innovate UK

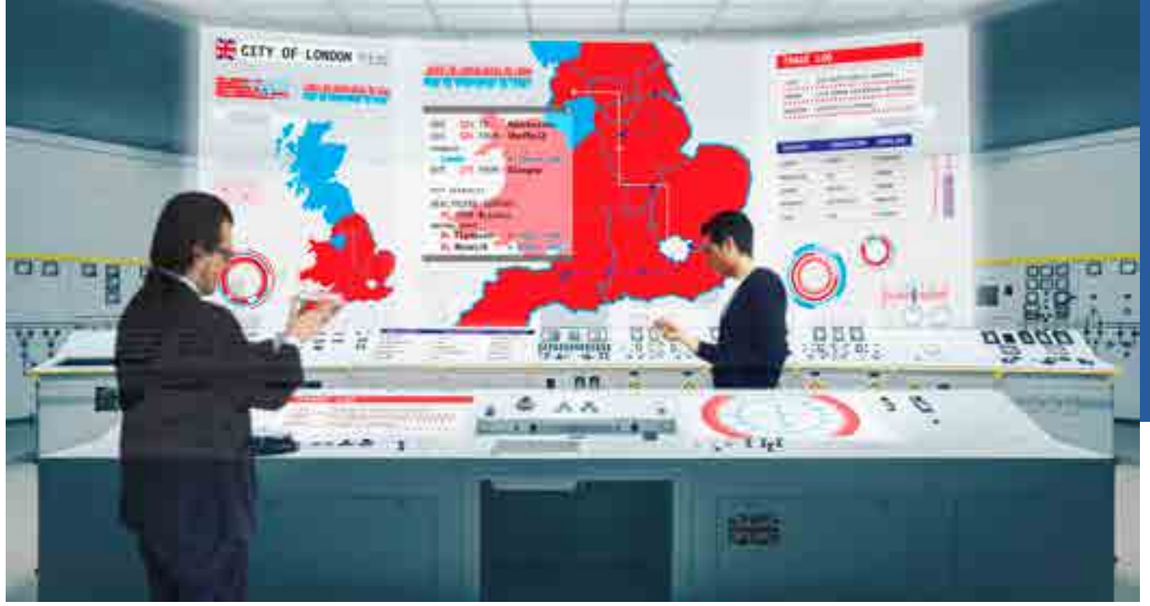
Engaging Sustainable Citizens:
- the key to delivering the UK's future cities

Cities thrive by meeting the needs of their citizens. Throughout history, those that have done this best have been the most important, and those that have done it longest have been the most powerful.

> "Cities have to do more with less. They can no longer just look to do things better, they have to do better things.

Urbanisation and resource challenges now mean that cities have to do more with less. They can no longer just look to do things better, they have to do better things. One critical way to do this is to integrate city systems so that they reinforce rather than antagonise one another - taking a systemic approach to city planning allows the whole to be seen together, and to create infrastructure systems that work synergistically.

In 2016 we worked with Forum for the Future and Ipsos Mori to understand how city systems could be integrated in our cities of the future – and consulted with citizens across the UK to understand their preferences. The full report can viewed here, and one of the key outputs of this work was a set of 8 design principles for city system integration, which are set out below. These are principles that we look to follow in our funding decisions to ensure we are building cities fit for the future.



Eight Design Principles for City System Integration

1: Resilient and Evolutionary

Systems need to be designed and integrated in a way which leaves them open to evolution and adaptation in the face of change. And because systems are interrelated and non-linear, integration must allow for changes to be made to parts of the system without failure of the whole. We should not over-optimise systems integration for efficiency because that can reduce their resilience – instead, what we need is redundancy or fault tolerance so that integrated systems are not overly vulnerable to one component failing, and can self-stabilise.

We should also not look for generic solutions to apply over all urban areas. As in ecological systems, resilience comes from diversity. Creating an ecosystem of opportunities and system integration solutions allows urban areas to adapt as circumstances change. Each solution can rise, and fall, and fail, and evolve in different places and at different times according to the needs of citizens and their cities.

2: Tech-enabled, but not tech-centered

Very often, when people talk about the integration of different systems, they talk about 'smart' attributes and integration via digital technology.

Undoubtedly, strong digital infrastructure is critical to systems integration. Urban systems will become better integrated through digital intelligence – both in terms of their functionality and in how they relate to other systems. We know that digital technology is a powerful enabled of system change by enhancing information flows and enabling greater stakeholder collaboration.

But, as research has shown, digital infrastructure is not necessarily the most important precondition for good integration, the most challenging element of creating integrated solutions, nor free of risks. If your biggest economic drag as a city is the diet of the local people, for example, then a 'techno fix' is unlikely to be most helpful. There is also the risk that whenever a city builds a technologically centred integration solution and outsources the running of that solution to a tech company, it is deskilling people.

As many citizens indicated during our dialogue series, technological solutions should be calibrated in such a way to encourage social interaction and build skills.

3: Well-Governed

It is the shape and quality of governance systems that is a key determinant of the success of system integration. For instance, more centralised, top-down forms of governance will result in completely different types of integration solutions than distributed, localised governance.

We must recognise that governance can come from different places, and that appropriate governance for some integration solutions may not follow traditional government-led services. As more differentiated forms of governance begin to emerge, the possibilities for different models of systems integration will grow as well.

4: Sustainable

If the purpose of system integration is to enable better lives, then it should actively enable sustainability. Sustainability is a quality of the whole larger system, not of just one part. Therefore, we cannot have a sustainable waste system within an unsustainable broader urban network. Any urban systems integration solution must enhance our social and political foundations, and do so within environmental limits.

As citizen engagement has made clear, people in UK cities are looking for urban solutions which will help build social fabric. Many spoke of the need to continue facilitating local culture, heritage and creativity. People expressed a clear desire for technologies which encouraged social engagement rather than creating alienating environments where people spend more and more time sitting in front of screens alone.

5: Human Centered

Integrating systems means integrating people. In the process of doing so, therefore, we have to consider people's attitudes, aspirations and behaviours. Will behaviour change be necessary in order to make the system integration successful?

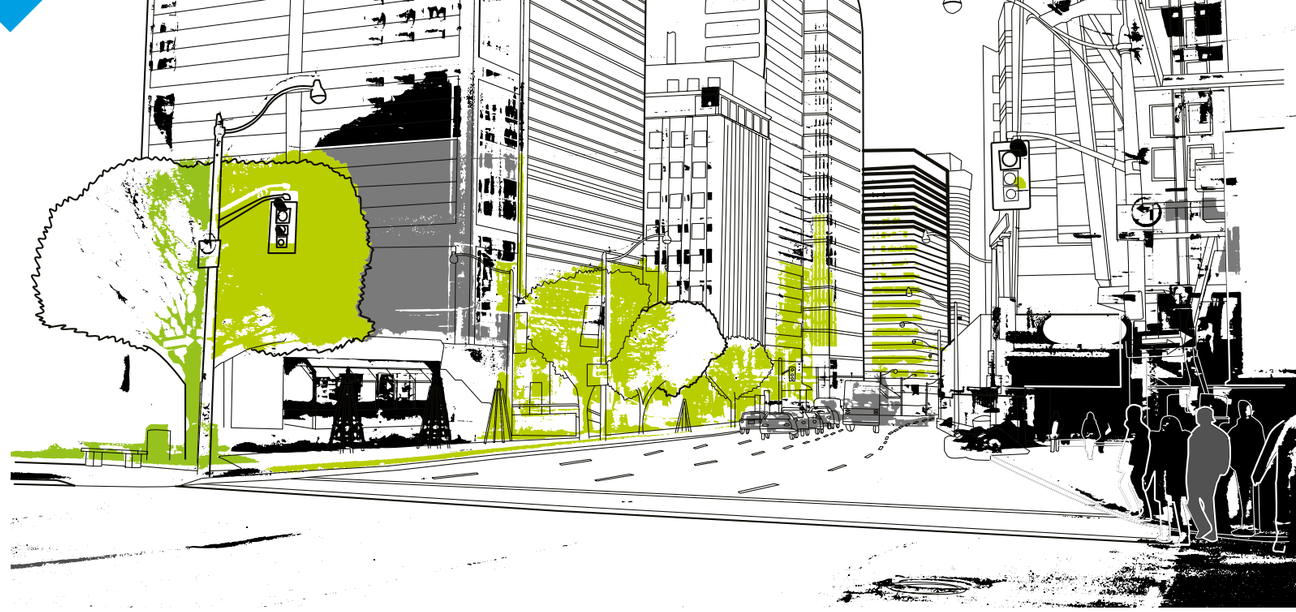
In order to create integrated systems in cities we need to have a clear vision of what they look like. These visions must be participatory, widely distributed, and communally owned. In many ways, the biggest barrier of cities in implementing integrated solutions is not technology or money, but the capability of people living in those cities to think about and act on that integration.

It is a challenge which requires us to give people the knowledge and skills to ask the right questions and to stimulate participation.

6: Globally Linked

Many of the urban issues we face today – from overcrowding to traffic congestion to pressures on healthcare systems – are issues endemic to many cities around the world. And although the solutions we craft to tackle these will undoubtedly be bespoke in order to be effective, there is much we can learn from the practice of other cities.

This is why global urban networks like C40 and EMBARQ are so useful – they help distil urban planning and delivery lessons, and translate them to other contexts. Digital technology is also a critical enabler here: it not only connects hard infrastructure but also helps create communities of interest around the world.



7: Valued Networked

The challenge with integrated solutions is that their value is often less straightforward to articulate, since their core value might not be about delivering financial returns to the principle funder.

Green roofs, for example, generate both tangible and intangible value that will accrue to a large number of beneficiaries. They can deliver improved air quality, a boost in urban food supply, physical and mental health benefits, biodiversity and wildlife enhancement, a reduced albedo effect, lower energy use in buildings, and reduced storm-water runoff. Most of these benefits don't accrue directly to the developer installing a green roof, which can make it harder to articulate the business case for the investment, despite the very large and real benefits to society as a whole. Instead, a mapping exercise may be needed to identify the key areas of value which will be delivered, and the beneficiaries.

And then a 'value network' should be formed to design and deliver the integrated solution on that basis. In this case, one can imagine a green roofs scheme could include a partnership between commercial real estate developers, energy companies, environmental agencies, healthcare organisations and food suppliers, amongst others.

8: Transport

There are privacy and security concerns around the use of 'smart' technologies to integrate and deliver urban services.

It is clear that people are willing to give up a degree of their privacy in exchange for a useful service (for instance personal data on a dating site, or location data on a smart phone in order to get to where they need to go), but where things go wrong is where people feel they haven't consented to the use of their data.

Feedback from the project consistently showed that people weren't comfortable with any system outcome where their data was collected and used without their consent, owned by others, or where they had no ability to turn off the data-harvesting technology. Transparency in systems integration is therefore key, as is respect for privacy.

ABOUT THE AUTHOR

Dr James Taplin joined Innovate UK in August 2014 to help shape and drive their new urban living innovation programme. He is Innovate UK's Lead Technologist for Urban Living, with an academic background in ecology and environmental economics.

NEIL JONES
10:10 Climate Action

Time to Lighten Up

- making the switch to LED Street Lights

Many councils have made great strides towards cleaner, cheaper and more reliable street lights over the last few years. But there's still a big opportunity awaiting those councils yet to make the switch to LEDs.

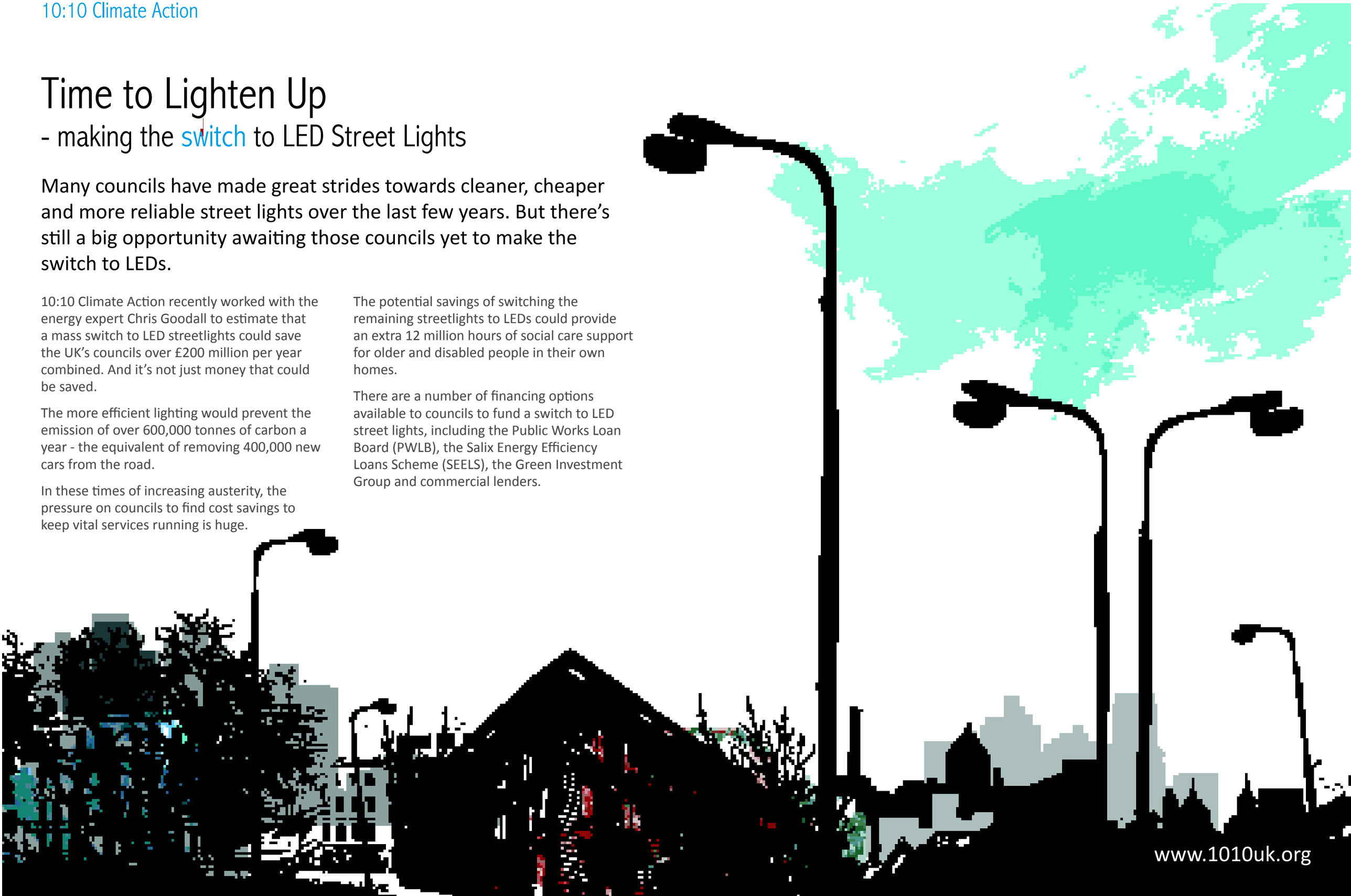
10:10 Climate Action recently worked with the energy expert Chris Goodall to estimate that a mass switch to LED streetlights could save the UK's councils over £200 million per year combined. And it's not just money that could be saved.

The more efficient lighting would prevent the emission of over 600,000 tonnes of carbon a year - the equivalent of removing 400,000 new cars from the road.

In these times of increasing austerity, the pressure on councils to find cost savings to keep vital services running is huge.

The potential savings of switching the remaining streetlights to LEDs could provide an extra 12 million hours of social care support for older and disabled people in their own homes.

There are a number of financing options available to councils to fund a switch to LED street lights, including the Public Works Loan Board (PWLB), the Salix Energy Efficiency Loans Scheme (SEELS), the Green Investment Group and commercial lenders.



www.1010uk.org

> A mass switch to LED streetlights could save the UK's councils over £200 million per year combined...the equivalent of removing 400,000 new cars from the road.

In Liverpool, the city council has invested £11m from the capital budget since 2014, but is already saving over £1.5m every year in maintenance and energy bills from converting 21,000 old sodium street lamps to modern LEDs.

Compared to conventional lights which have to be replaced after 4-6 years, LEDs can last for over 20 years. This reduces waste and also saves time and money on maintenance. LEDs have demonstrated energy savings of up to 50-70% and this can rise as high as 80% when combined with smart sensors and controls in a Central Management System (CMS).

LEDs make this possible since unlike older street lights, they can be brought back up to full brightness instantly so they can be dimmed or turned off when not needed.

Leicester City Council have converted over 32,500 street lights, saving £1m a year in electricity costs, and the equivalent of 5,350 tonnes of CO2. Leicester Assistant City Mayor for energy and sustainability, Cllr Adam Clarke, said: "It's a very worthwhile scheme bringing environmental benefits, lower running and repair costs and freeing up money as a result to use elsewhere."

A note of caution: LED streetlights with too a high proportion of blue light have sometimes proven to be controversial. Cardiff City Council have modelled best practice here , earning recognition from the International Dark Skies Association for their use of 'warm white' <3000 Kelvin LED lanterns, which reduce sky glow and help to tackle the problem of light pollution.

The Lighten Up campaign

Whilst the benefits of LEDs have been known for a while, some councils have been slow to switch. By 2014, only 10% of councils had switched to LED streetlights, with the most recent estimate suggesting that this has now increased to 20%.

That's why 10:10 Climate Action have launched the Lighten Up campaign, asking councils to make the most of the benefits of LEDs and take a pledge to switch their street lights within five years.

ABOUT THE AUTHOR

Neil Jones is the projects manager at 10:10 Climate Action. If you would like to find out further information about the 'Lighten Up' campaign you can visit www.1010uk.org.

You can also contact Neil directly if you would like to discuss how your Council can sign the pledge and deliver energy efficiency savings by switching to LED lighting by emailing:

neil.jones@1010uk.org

Case Study: A Brighter Future - Southend on Sea Borough Council

Southend on Sea became the first town in England to take advantage of the green finance offered by the Green Investment Bank to drive forward the delivery of an ambitious LED street lighting programme.

The project is a key component of Southend Borough Council's ambitions to become a 'low carbon, smart city' and saw every street light in the town switch to a new LED equivalent at a total cost of £13.5 million. The cost was split between an £8.2 million arrangement with the Green Investment Bank and a £5.1 million grant from the Department for Transport.

Their LED street light programme resulted in a total of 14,500 street lights being replaced with modern LEDs, which included the replacement of 3,000 columns and the implementation of a new central management system (CMS).

The CMS enables the Council brighten and dim individual lights depending on the needs of their residents and communities. Overall the LED street light programme is anticipated to result in a 57% energy efficiency saving for the Council - an excellent incentive for any local authority to switch to LED street lights.

PROFESSOR IAN COLBECK
University of Essex

Air Pollution: Monitoring the silent killer

It is estimated that in the UK air pollution, in the form of particulate matter (PM), contributes to the premature death of 29,000 people each year and an associated loss of a total of 340,000 life years... Much of the PM in urban pollution hotspots, particularly those close to roads, comes from traffic sources - this article explores the role of remote sensing techniques to help tackle this silent killer.

In London diesel road traffic is responsible for about 40 per cent of PM10 emissions. Particulate emissions from diesel vehicles are more harmful than those from other sources. They contain high amounts of black carbon and this has been shown to be up to nine times more deadly than other types of PM.

The International Agency for Research on Cancer, in 2012, listed diesel exhaust pollution as a Class 1 carcinogen. A recent YouGov poll found that 58% of those surveyed believed that air pollution in the UK was harmful to health. It has been suggested that community engagement with air pollution should be encouraged and individuals informed how they can make a difference.

For many years the Driver and Vehicle Standards Agency (DVSA) and its forerunner the Vehicle and Operator Services Agency have operated a smoky vehicle hotline where members of the public can report an excessively smoky lorry (HGV) or bus (PSV).

> “Community engagement with air pollution should be encouraged and individuals informed of how they can make a difference.

The DVSA will contact the owner of the vehicle directly and arrange an appropriate course of remedial action. Many local authorities (LA) promote this weblink on their websites.

However, few LAs authorities allow members of the public to report excessive smoke from private vehicles; there is no formal mechanism for dealing them although some LAs state that they will contact owners in an advisory capacity.

How well used is the DVSA reporting scheme? From May 2015 to August 2016 316 HGVs and 958 PSVs were reported via online forms. Two HGVs and eight PSVs were reported via the telephone hotline over the same period.

Typically between 40 and 60 PSVs and 20 to 30 HGVs are reported each month. July 2015 was the exception when 130 PSVs were reported (Figure 1). However 50 of these came from a single location which suggests a single form being submitted multiple times.

Overall smoky vehicles were logged from all over the UK with the region within the M25 having the greatest number of PSVs emitting excessive smoke (Figure 2).

Figure 2. Location of HGVs (orange) and PSVs (blue) reported to the DVSA during September 2015

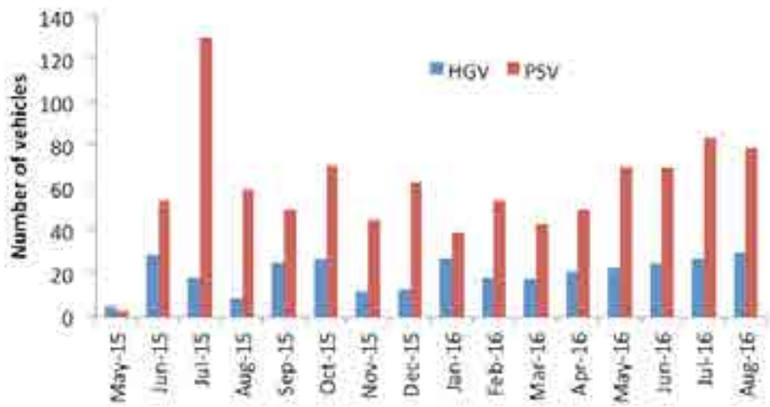
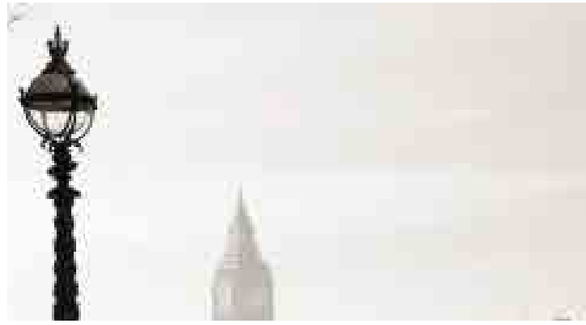


Figure 1. Number of vehicles reported to the DVSA smoky vehicle hotline between May 2015 and August 2016



> The European Commission has recently called on national governments to use remote sensing techniques to measure real driving emissions.

The police and DVSA have the power to carry out spot checks on commercial vehicles at the roadside. In 2015 over 128,000 mechanical checks were made but this is some 27,000 fewer than in 2013. However the prohibition rate has remained around 36%. From August 2017, roadside checks have included emissions cheat devices such as:

- using devices designed to stop emissions control systems from working
- removing the diesel particulate filter or trap
- using cheap, fake emission reduction devices or diesel exhaust fluid
- using illegal engine modifications which result in excessive emissions
- removing or bypassing the exhaust gas recirculation valve

The Road Traffic (Vehicle Emissions) (Fixed Penalty) (Scotland) Regulations 2003 allows LAs in Scotland to adopt powers to enable roadside vehicle emissions testing. These powers are optional, but provide authorities with a useful additional tool for addressing air quality issues in their areas. In 2016 the BBC identified just 13 LAs that are making use of these powers.

In England the Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002 allow any LA which has declared an Air Quality Management Area (AQMA) to conduct roadside vehicle emission testing within the boundary of the AQMA and issue Fixed Penalty Notices if a vehicle fails the test.

There was an initial flurry of interest with TRL, in 2005, concluding that roadside testing could identify high polluting vehicles but as newer vehicles came onto the market, with lower emissions the benefits and cost effectiveness were limited.

Since 2009 new diesel cars have a diesel particulate filter (DPF) in the exhaust to reduce pollution levels. However they can get clogged up and break down a replacement can cost around £1,000. While it is illegal to drive a car with the DPF removed, it is not illegal for garages to take them out.

DVSA figures reveal 1,800 diesel drivers have been caught without a DPF since 2014. It is expected that the actual number of vehicles without a functioning DPF is significantly higher. Currently MoT tests require diesel cars to have a DPF; but this is checked by a visual inspection rather than emissions analysis. From May 2018 changes to the MoT should make it better able to detect where a DPF has been tampered with.

The European Commission has recently called on national governments to use remote sensing techniques to measure real driving emissions. While remote sensing has been used in the US over the last decade, it has not been used at to any great extent in Europe.

However there has been renewed interest in this method recently. In July 2017 China announced a national regulation which involves the use of remote sensing equipment to monitor pollutants in exhaust from diesel vehicles; although there's no follow-up enforcement action for high emitting vehicles.

As technology improves it is likely that remote sensing technology becomes the norm. However before such methods can be used for regulatory emissions enforcement a number of key questions need to be addressed:

How does one account for weather conditions, is the vehicle accelerating or decelerating, how is engine load taken into account, is an individual measurement sufficient for legal action.

ABOUT THE AUTHOR

Ian Colbeck is Professor of Environmental Science in the School of Biological Sciences. He has amassed over 30 years of considerable achievements and experience over a wide gamut of research interests but predominantly in the field of aerosol science and air pollution.

FInd out more about Ian's work at the University of Essex by visiting:

www.essex.ac.uk

JEN JONES
Galapagos Conservation Trust

The Galapagos:
- tackling the issue of plastic waste

www.galapagosconservation.org.uk

Galapagos Conservation Trust

Over the next twelve months we will be following the work of the Galapagos Conservation Trust (GCT), highlighting the role that cities and towns can play in helping to address some of our planet's most pressing environmental issues. Here, Jen Jones, Projects Manager at GCT, explores the work that the charity are undertaking to reduce the problems associated with plastic in one of our planet's most renowned environments, the Galapagos Islands.

These days, demand for plastic is so high that in the next eight years it is predicted that as much will be produced as was in the whole of the 20th century. Management of plastic waste (or arguably, product design) has not kept pace with this production and with approximately 8 million tons of plastic debris entering the world's ocean each year, plastic now contaminates every marine habitat, including the Galapagos Marine Reserve.

The Islands are more vulnerable than most places due to the high number of endemic species that are found nowhere else on Earth. This uniqueness of the nature in Galapagos attracts around 220,000 visitors a year and this income underpins the local economy on which the Islands' population of 30,000 people depend. A growing plastic pollution problem, if unchecked, not only represents a significant threat to the unique biodiversity of Galapagos, but also to local livelihoods.

We are optimistic, however.

According to leading scientists, Galapagos is probably best placed of anywhere in the world to show how a marine reserve can tackle the growing global environmental problem of marine plastic pollution. By answering a number of key scientific questions to inform behaviour change and conservation management plans and by working with local authorities and businesses to influence what is imported into the Islands and how waste is managed, we really could work towards the world's first plastic-free marine reserve.

A powerful partnership led by the Galapagos Conservation Trust, Galapagos National Park and Galapagos Science Center has been formed to address these core scientific questions and drive education messages to encourage environmentally conscious behaviour among local people and businesses as well as the tourism industry.

This programme will not only protect the unique wildlife of Galapagos for future generations, but will provide a template on how to address marine plastic pollution globally.

For more information, or to share any learnings from plastic projects in the UK, please contact Jen on jen@gct.org.

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