



BREAKTHROUGH CITIES

Business models for solving urban challenges

An Action Guide for City Authorities and SMEs



VOLANS

Innovate UK

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Contents

Forewords	<i>pgs. 1 - 2</i>
<hr/>	
1.0 Introduction	<i>pg. 3</i>
<hr/>	
2.0 Time for Breakthrough business models	<i>pg. 4</i>
<hr/>	
3.0 The local government-SME interface: Breaking the procurement deadlock	<i>pg. 5</i>
<hr/>	
4.0 Seven business model principles for solving urban challenges	<i>pg. 6</i>
Principle 1	<i>pg. 7</i>
Principle 2	<i>pg. 8</i>
Principle 3	<i>pg. 9</i>
Principle 4	<i>pg. 10</i>
Principle 5	<i>pg. 11</i>
Principle 6	<i>pg. 12</i>
Principle 7	<i>pg. 13</i>
<hr/>	
5.1 Case study #1: Retrofitting social housing to 2050 energy efficiency standards	<i>pg. 14</i>
<hr/>	
5.2 Case study #2: Citizen-powered renewable energy in local communities	<i>pg. 15</i>
<hr/>	
5.3 Case study #3: Driving economic growth around climate innovation	<i>pg. 16</i>
<hr/>	
Annexes	<i>pg. 17</i>
Annex A) Urban challenge #1: Improving air quality	
Annex B) Urban challenge #2: Healthy ageing	<i>pg. 18</i>
Annex C) Urban challenge #3: Decarbonisation of the built environment	<i>pg. 19</i>
Annex D) Collaboration between city authorities and SMEs: common challenges	<i>pg. 21</i>
Annex E) Seven business model principles for solving urban challenges	<i>pg. 22</i>
<hr/>	
8.0 End notes	<i>pg. 23</i>
<hr/>	
9.0 Further resources	<i>pg. 25</i>
<hr/>	

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John Elkington, Chairman and Chief Pollinator, Volans

We are delighted to present this Action Guide, which attempts to distil our learnings from a series of three Breakthrough Cities workshops that took place between November 2017 and March 2018. We are grateful both to Innovate UK and to the three UK cities of Nottingham, Newcastle and London for co-convening and contributing to the workshops.

By 2050, the proportion of the world population living in cities is expected to rise to somewhere approaching 75%. This equates to more than a million new urban dwellers being added globally every week for the next 30 years. 65% of the infrastructure we will need in 2050 is yet to be built. Geoffrey West of the Santa Fe Institute even talks in terms of a new epoch called the **Urbanocene**.

No surprise, then, that many of the global challenges we face today are most urgently manifested in cities. Our Breakthrough Cities programme kicked off before the publication of the UK Government's **Industrial Strategy**, but the programme's design, focus areas and implementation very much align with the Strategy. We have learned lots along the way about the potential for cities to help address the **UN Sustainable Development Goals** - and about some of the most important barriers that will need to be surmounted.

Our focus in Nottingham was on **air quality**, in Newcastle it was **healthy ageing**, and in London we zeroed in on the **decarbonisation of the built environment**. Finding ways to combat such challenges was once seen as a net drag on the economy. No longer.

"The move to cleaner economic growth – through low carbon technologies and the efficient use of resources – is one of the greatest industrial opportunities of our time," the Industrial Strategy concludes. "By one estimate," it notes, "the UK's clean economy could grow at four times the rate of GDP."

In the three cases of air quality, healthy ageing and decarbonisation of the built environment, the UK faces growing challenges. But the fact that most other countries in the world already face - or will soon face - similar problems means that solutions developed here have the potential to inspire and sell globally.

We encourage feedback – good, bad or ugly. And we look forward to collaborating with other cities and companies to help develop practical solutions to the most important challenge we collectively face: how to live well within the means of the planet.

You can contact me via email at john@volans.com and the main authors of this Guide, Jacqueline Lim and Richard Roberts, can be reached at jacqueline@volans.com and r.roberts@volans.com respectively.



Niraj Saraf, Urban Innovation Lead, Innovate UK

"You think that because you understand "one" that you must therefore understand "two" because one and one make two. But you forget that you must also understand "and."

— Donella H. Meadows, [Thinking in Systems: A Primer](#)

As the human race becomes a primarily urban species, city leaders everywhere are trying to deliver economic growth, a good quality of life for citizens and workers, and resilience, but through organisations and governance structures which were better suited to the Industrial Revolution than to the complexities of the 21st Century.

It isn't working. The realities of climate change, ageing populations, obesity, air pollution, long-term unemployment and more won't yield to linear solutions which emerge solely from either government, business, academia or civil society. As the World Economic Forum notes, "We're going to need some surprising alliances that bring different sectors together if we are to overcome ... challenges."

How are these alliances going to come about and how will they work? Volans have been doing interesting work on this for the UN Global Compact through [Project Breakthrough](#). Last summer, I challenged them to apply that thinking at city scale. Three workshops and many conversations later, this report is the result.

Innovate UK's approach to urbanisation has been twofold: first, demonstrating to city authorities the promise of new technologies applied to city management (and thereby creating capacity for adopting them), and second, investing in business-led innovation projects designed to bridge silos. Many promising projects have been delivered, with new commercial offerings developed as a result. And yet, there remain significant stumbling blocks to the level of transformation our cities need.

One challenge is that many city authorities don't have formal mechanisms for engaging with SMEs, the companies often responsible for breakthrough innovation. Another is that if a service is developed which, for example, cuts across different silos, there isn't always an obvious customer. And embracing those two challenges is a third: the way the public sector does procurement.

These are the challenges on which we have been working with Volans. There are pockets of innovation in Local Authorities all over the country and this report cites a good number of examples. These need to be celebrated, shared widely, and built upon, but, critically, what we need is a more systematic approach to enabling many more such examples. This report is a significant step in that direction. Combined with the many relevant projects being developed through the Industrial Strategy Challenge Fund, the UK is strongly placed to show the rest of the world what the future of cities can be. Let's keep in touch to ensure this happens.

I can be reached at niraj.saraf@innovateuk.gov.uk.

1.0 Introduction

This Action Guide is for anyone whose aim is to solve one or more of the multitude of complex challenges that are a feature of modern urban life. The Guide draws heavily on the experience of Small and Medium-sized Enterprises (SMEs) and city authorities (including both local authorities and other public-sector bodies) in the UK, but the framework and principles we outline in Section 4 are not specific either to the UK or to SMEs and city authorities: they are intended to be applicable in any urban context globally - and system change can be initiated by individuals in any sector.

Background

Over the course of three workshops in late 2017 and early 2018, [Volans](#), [Innovate UK](#) and the [Knowledge Transfer Network \(KTN\)](#) convened more than 200 innovators from SMEs and city authorities. The workshop series had two, sequential goals. The first: to provide a space for SMEs and city authorities to meet, converse, and build trust. The second: to explore the business and collaboration models needed to implement and scale effective solutions to complex urban challenges.

In order to anchor the workshops, we focused each event on a specific urban challenge that was directly relevant to the host city, as well as being of growing interest to other cities across the UK and globally.

The three urban challenges we looked at were:

- 1. Improving air quality:** as part of its Clean Air Strategy, the UK Government launched the Clean Air Fund in March 2018, with a total of £220m in funding available for local authorities to bid on in pursuit of improved air quality.¹
- 2. Healthy ageing:** an 'Ageing Society' was first highlighted as one of the UK Government's four 'Grand Challenges' in its Industrial Strategy white paper (published in November 2017). A £300m competitive fund has since been announced in March 2018 to develop the innovations and new technologies that can help the UK prepare for the challenge of an ageing society.²
- 3. Decarbonisation of the built environment:** one of the objectives of the UK Government's Transforming Construction sector deal, announced as part of the Industrial Strategy white paper in November 2017, is to achieve a 50% reduction in greenhouse gas emissions in the built environment by 2025.³

We provide more context on each of these urban challenges in Annexes A - C (pages 17 - 19).

2.0 Time for Breakthrough business models

Our goal is to catalyse solutions that address urban challenges at scale, and which can be sustained over time. Business models - which are emphatically not just for business⁴ - are the key to this.

A business model is the way in which an organisation (or group of organisations) creates, delivers and captures value. Business models operate at multiple different levels:

1. Individual products and services.
2. Organisations (including public and non-profit ones).
3. Systems, or 'ecosystems', involving a diverse range of stakeholders (companies, city authorities and other government bodies, citizens, etc).

Much of the literature on business models focuses on the first two levels. This Action Guide focuses instead on system-level business models, though many of the strategies and principles we outline are also relevant at the level of a single organisation or product.

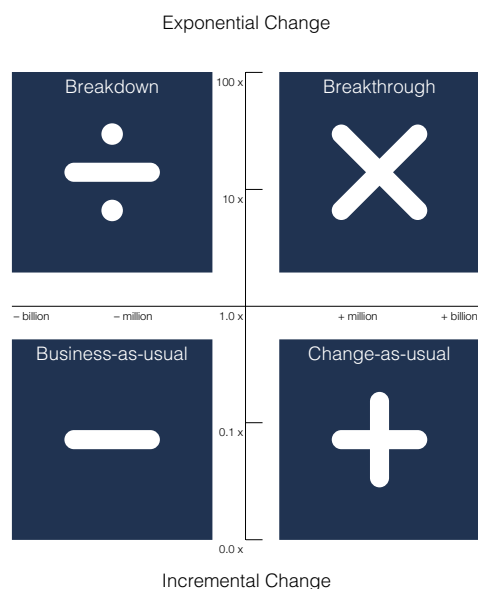
To borrow a favourite slogan of Silicon Valley entrepreneurs, we want to encourage "10X rather than 10%" solutions. That is, rather than looking for incremental improvements on the status quo, we need to pilot and scale solutions that are somewhere in the order of 10 times more efficient and impactful than the status quo. We call this approach Breakthrough (see Figure 1 below).

However, these 10X solutions cannot come with a 10X price tag: they typically must be cost neutral (or better). While technology is a key enabler of 10X solutions, we also urgently require new business models that can create the right conditions for solutions to scale. Critically, this means bringing together public and private sector actors in new and different configurations.

Figure 1: The Breakthrough Compass

At a time when many of the challenges we face are progressing along exponential trajectories, Breakthrough approaches seek to harness new mindsets, technologies and business models to drive positive change that goes exponential in terms of pace and scale.

You can find out more about this on the Project Breakthrough website (www.projectbreakthrough.io) and in Volans' previous report, [Breakthrough Business Models: Exponentially more Social, Lean, Integrated and Circular](#).



3.0 *The local government-SME interface: Breaking the procurement deadlock*

At present, effective collaboration between city authorities and SMEs is the exception rather than the norm. When it does work, it is typically thanks to the entrepreneurial spirit and hard work of individuals, who have the grit and passion to make things happen in the face of adversity. It shouldn't be so hard.

The complexities faced by SMEs in navigating public procurement processes is one important piece of the overall picture. The UK Government spends approximately 25% of its procurement budget with SMEs (about £5.6bn in 2015/2016).⁵ At the city level, a 2014 study revealed that small firm spending represented just 12.5% of overall local authority private sector spend.⁶ A 2017 techUK survey of 'GovTech' SMEs found that 90% did not believe that civil servant buyers had a good understanding of how SMEs can meet their needs.⁷

But becoming a service provider is by no means the only way for SMEs and city authorities to collaborate. City authorities can also be the channel to market, rather than the client itself; a demand aggregator (e.g. for things that citizens or local residents want); or a market facilitator (e.g. introducing complementary, new solutions by SMEs to a city bike scheme operator).

In many instances, larger companies play an intermediary role, aggregating SMEs through their supply chains. Often this makes sense, but the implosion of Carillion in January 2018 was a timely reminder of the dangers inherent in letting large companies become too integral to the delivery of urban solutions.

A number of initiatives designed to make it easier for UK government bodies to collaborate with SMEs already exist.⁸ Notable examples include:

- The centralisation of some tenders (e.g. G-Cloud [Digital Marketplace](#)).
- The support offered by the [Small Business Research Initiative](#) (SBRI), run by Innovate UK.
- Specific guidance for procurement practitioners to [increase support towards SMEs](#) as well as to incorporate wider social, economic and environment outcomes into their procurement processes (i.e. [Social Value Act](#), 2013).

Uptake, however, has not been huge. According to the Local Government Association's 2017 report, [Encouraging Innovation in Local Government Procurement](#), practitioners in local government have little knowledge of SBRI or other pre-competitive procurement (PCP) programmes.⁹ The [GovTech Catalyst and linked £20m fund](#), announced in late 2017, uses the SBRI process to help the public sector identify and work with small, emerging technology firms to develop and scale new innovative solutions to specific public sector challenges.¹⁰ Uptake remains to be seen, although the offer of [monthly meet-ups](#) for GovTech start-ups with the GovTech Catalyst team is a positive step towards breaking down silos.

BOX 1: Challenges to collaboration between city authorities and SMEs

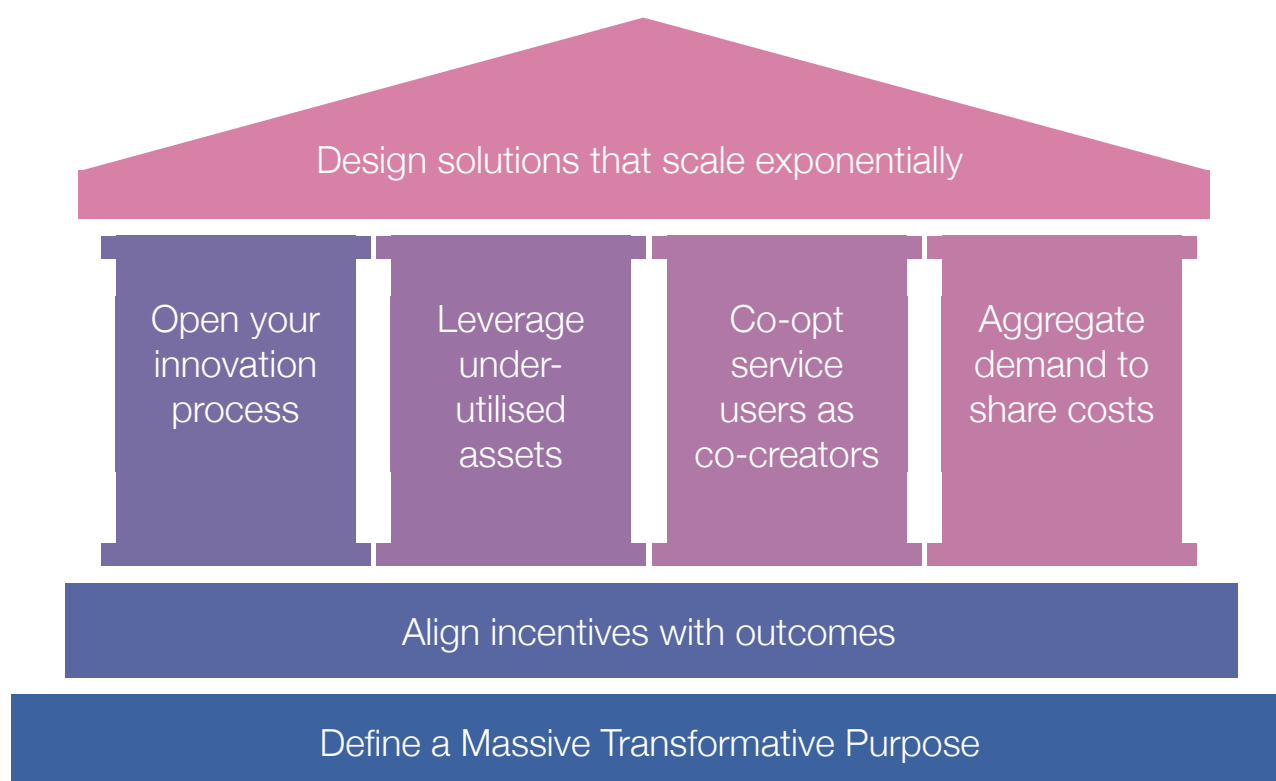
These challenges were raised repeatedly during the Breakthrough Cities workshop series. You can find more detail on each of them in Annex D.

- Negative stereotypes.
- You only know what you know.
- It's nobody's and everybody's job.
- Fear of admitting failure.
- Lack of time and space for pre-competitive collaboration.
- Short-termism.
- Death by pilot.

4.0 *Seven business model principles for solving urban challenges*

Building on Volans' prior work on Breakthrough Business Models¹¹, and drawing on insights from the three workshops held between November 2017 and March 2018, we've developed a set of seven principles to guide anyone seeking to build system-level business models to solve 10X challenges.

This framework can be used by actors within city authorities, SMEs and other stakeholders seeking to develop and scale more effective, joined-up, solutions to urban challenges.



We detail each principle in the framework over the next few pages.

Define a Massive Transformative Purpose¹²

Status quo

When scoping a new project, most people start by looking at the existing system and asking themselves where incremental improvements can be made.

Future quo

Set a goal that explicitly aims for transformation rather than incremental improvement. Use this bold vision to motivate and inspire others to work with you.

Examples

[Government; UK]

The **Circular Peterborough Commitment** sets a 10X goal for the whole city: to operate as a circular city by 2050. One example of how the city is going about achieving this goal is through its **Share Peterborough** platform, which enables companies to benefit from sharing goods and services that are under-utilised or no longer needed.

[Government; UK]

Barking & Dagenham Council's Borough Manifesto was published in 2017 following the largest public consultation ever undertaken in the borough, with more than 3,000 residents participating. The Council is now trialling a Digital Connector tool (developed by **Future Cities Catapult** and others) that brings together varied datasets in a way that allows progress to be easily visualised and tracked by citizens. Crucially, it also allows the Council to work more effectively with other stakeholders, including SMEs, by providing a holistic, evidence-based view of the multiplicity of factors that impact on the borough's aspirations, challenges and interventions.¹³

[Government; US]

Pittsburgh's OnePGH Resilience Strategy was developed in collaboration with **Rockefeller's 100 Resilient Cities** programme, drawing on more than a year of input from citizens. The strategy outlines the city's vision for creating resilience - enabling various stakeholders in the city to act in non-siloed ways and produce "resilience dividends" (i.e. multiple benefits from one activity). In parallel, the city's **Roadmap for Inclusive Innovation** serves as a living strategic plan for promoting cross-sector partnerships and collaboration with business and other stakeholders.

Align incentives with outcomes

Status quo

Misaligned incentives are probably the most common reason why complex problems go unsolved. Incentivising outputs rather than outcomes is the norm in all sectors.

Future quo

Understand what incentives drive different stakeholders, and design business models that ensure all stakeholders are incentivised to deliver the desired outcomes.

Examples

[Government; UK]

Ways to Wellness Social Impact Bond incentivises the delivery of non-medical interventions by social sector organisations ('social prescribing'). The bond, initiated by Newcastle West Clinical Commissioning Group (now part of Newcastle Gateshead CCG) and other partners, pays providers based on patient outcomes and a consequent reduction in the strain on NHS resources.

[SME; UK]

BetterPoints operates a digital platform that motivates users to engage in positive behaviours such as walking and exercising, rewarding them with incentives like high-street discounts and vouchers. A 4-month pilot project in Birmingham led to an 80% success rate of shifting people's lifestyles from inactive to active (as defined by Sport England). At the same time, the project generated data for the city council on how people use its parks, enabling the council to optimise facilities and design of the parks. Similar projects are now underway in Reading as well as Bologna (Italy).

[SME; Singapore]

Kaer pioneered a new business model, Kaer Air, offering "air-conditioning as a service" to customers who pay a fixed rate, on a pay-per-use basis, for cool air in their buildings. Kaer retains ownership of its air-conditioning systems, and takes on all future costs related to operations and maintenance, including electricity and repair bills. In doing so, Kaer shifts the responsibility of reducing energy consumption away from building operators and owners. Kaer instead is incentivised to optimise its own profitability through ensuring that air-conditioning systems run as efficiently as possible.¹⁴

Make your innovation process as open as possible,
as early as possible

Status quo

True innovation comes from unlikely connections, yet most innovation processes are closely controlled and opportunities for outsiders to contribute are limited. Effective pre-commercial procurement processes are not widely used by city authorities.

Future quo

Invite outsiders into the process at an early stage. Design a phased process that allows you to start with a broad range of potential solutions and gradually whittle these down. Challenge prizes and “start-up in residence” programmes can be useful formats for opening up problems to a wider group of innovators.

Examples

[Government; UK]

City Hospitals Sunderland NHS Foundation Trust appointed a dedicated Innovation Manager, who oversees a team of Innovation Scouts who (i) support staff within the Trust to innovate (generating ideas for new products, improving processes or identifying an unmet need) and (ii) cultivate relationships with SMEs to understand the pipeline of new solutions.

[Government; UK]

Essex Challenge Prizes was initiated following an announcement by the Council in 2015 to invest £1m into the development and testing of Challenge Prizes as a way of sourcing solutions to some of the county’s most difficult challenges. With support from **Nesta**, the Council launched a pilot prize in May 2016 to tackle the issue of social isolation amongst parents with young children.¹⁵ The Council has since launched its second competition - **Challenge Dementia Prize** - to uncover new solutions and provide support to speed up their development.

[Government; UK]

CivTech, run by the Scottish Government, blends the use of Challenges with an accelerator programme to provide a more open, low-risk way for government bodies to work with innovative SMEs on solving challenges.¹⁶

The Scottish Environment Protection Agency (SEPA) was one organisation that benefited. Their challenge: creating better visualisations of airflow that can deliver more meaningful insights for action. CivTech worked with SEPA to shortlist proposals, providing the chosen companies with funding to further develop their proposals before undergoing a four-month accelerator programme to develop a Minimum Viable Product.

[Government; US]

Startup in Residence (STIR) connects startups with government agencies to develop technology products that address civic challenges. Partners work together over 16 weeks to co-develop a solution.¹⁷ First launched in 2014 as a pilot by the San Francisco Mayor’s Office of Civic Innovation, the programme has now been expanded to 11 cities in the US. **British Columbia** (Canada), **Amsterdam and The Hague** (The Netherlands) have also launched their own version of the STIR programme.

Leverage under-utilised assets

Status quo

A fixation on financial assets has led to a neglect of other assets and capabilities, such as data, people, relationships and physical infrastructure. As a result, most assets are currently under-utilised.

Future quo

Bring the full range of your organisation's assets and capabilities to the table. Your data or capacity to convene may be just as valuable as funding (if not more!). Look for opportunities to repurpose waste materials to move towards a more circular economy.

Examples

[Government; UK]

London DataStore is a free, open data-sharing resource for all, including citizens, businesses, researchers and developers. It contains a range of urban data - from house prices and transportation patterns to crime rates. More than 400 smartphone apps were created after London's transport data was included and the DataStore is credited with the success of companies like Citymapper, which has now launched its service in almost 40 cities globally. Other cities have replicated this, including **Open Data Manchester** and **Data Plymouth**.¹⁸ Bristol has gone one stage further: its **Bristol is Open** programme serves as a platform for companies to access data, but also test new technology in a real-world environment.¹⁹

[SME; UK]

Loop Hub is a circular economy marketplace that links together communities, corporates, city authorities and SMEs working in the built environment to buy and sell underutilised or unneeded equipment and materials that would otherwise be processed as waste. One of the company's early partners was Crossrail who provided industry feedback and agreed for Loop Hub to be trialled on Crossrail construction sites during the wind down phase.²⁰

[SME; UK]

See.Sense is an intelligent bike light with built-in sensors that empower cyclists to opt-in to provide crowdsourced anonymised insights on road surface conditions, dangerous intersections and real-time journeys. Customers therefore become data collectors, helping city planners better design infrastructure and policies that in turn, encourage more people to cycle.

Co-opt service users as solution co-creators

Status quo

Most users of public services are disengaged and passive. The services themselves often aren't designed to promote active engagement from users and are more likely to foster dependency than self-sufficiency.

Future quo

Make high-quality, ongoing citizen and stakeholder engagement a priority. Use tools and insights from behavioural psychology to "nudge" people towards choices that lead to better outcomes and put less strain on the system.

Examples

[SME; UK]

D4SC develops technologies that engage community members in gathering real-time intelligence and co-creating smarter cities. To improve public infrastructure in Plymouth, D4SC piloted its Changify #SmarterStreets people-powered decision-making platform. This resulted in a 22% reduction in the average cost of road inspection, increased citizen satisfaction, and led to a 20% increase in contractor responsiveness.

[Government; UK]

Transport for London works with developers and city authorities to develop 'travel plans' for residents and building users whilst planning new developments. Travel plans aim to increase opportunities for active travel (walking, cycling, public transport), which ultimately reduces congestion and other environmental problems associated with private vehicles. TfL is also now looking at **crowdsourcing** air quality data from commuters.

[Government; global]

UN-Habitat has been using Minecraft, the computer game, as a tool for involving those typically excluded from public engagement (e.g. youth, women and the urban poor) to redesign public spaces in their cities. Workshops are run in cities across the world to teach participants how to use the game, and then get them to design a model of public space on Minecraft. More than 17,000 people have since been involved in workshops globally.²¹ In the UK, Exeter is using **minecraft as a tool** for engaging citizens in urban design.

Aggregate demand

Status quo

City authorities and service providers often operate in a siloed way. Partnerships between cities to develop solutions to common challenges are also rare. This means the market for solutions is fragmented.

Future quo

Collaborate with others that face a similar set of circumstances to design an innovation challenge that addresses a shared need. That way the prize for innovators is bigger, whilst the up-front costs for the challenge owners are smaller.

Examples

[Government; UK]

Darlington Healthy New Towns (one of 10 Healthy New Towns pilots by NHS England) brings together city authorities, the NHS, housing developers, innovative SMEs and the non-profit sector to collaborate to improve the health and wellbeing of residents in the area through the design of housing and public spaces.

[Government; UK]

UrbanChallenge is an open call competition by the West Midlands Combined Authority to make the West Midlands a better place to live and work across four challenge areas – wellbeing, housing, youth unemployment and digital citizenship.

[Government; The Netherlands]

Amsterdam Smart City (ASC) is an innovation platform that allows citizens, companies and municipalities to share ideas for a public project aimed at guiding the city's sustainable growth. Set up by the Amsterdam Economic Board in 2009, ASC plays a crucial role in connecting those who submit ideas with the right stakeholders to accelerate progress, developing new markets and commercial opportunities for innovative solutions. ASC also finds avenues for successful solutions to be replicated elsewhere in the city. By mid 2017, ASC had accelerated more than 90 projects with over 130 partners.²²

Design solutions that can scale exponentially

Status quo

Most existing solutions to urban challenges offer incremental economies of scale, but the cost per unit falls fairly slowly as volume increases. Successful pilot projects often prove too expensive to be implemented at scale.

Future quo

Leverage technologies and network effects that enable solutions to scale exponentially, as marginal costs trend towards zero. Open source, platform-based solutions offer the most scalability. Financing matters too: look to build in mechanisms whereby a proportion of revenue gets automatically reinvested.

Examples

[SME; UK]

Ehab is a decentralised, Blockchain-based platform that enables homebuyers to access the latest, most sustainable housing technologies to co-design affordable, high-quality housing that they want. Land ownership and the building costs are financed initially by the crowd (at favourable rates compared to traditional lenders) via the Blockchain before homebuyers pay back over time to gain full ownership of their homes whilst providing a return to investors. With funding amongst local councils as the largest constraint to building affordable housing, Ehab offers an alternative, viable and scalable model.

[SME; US]

RideAustin is a non-profit, community ridesharing platform in Austin, Texas. Like Uber and Lyft, RideAustin is a platform-based business that leverages existing assets (private vehicles). This combination allows it to scale fast (though in RideAustin's case, the team behind it has deliberately chosen to keep it to one city only) with very low marginal costs for each additional ride fulfilled via the platform. The company offers open access to all its data to enable others to mine the data and create other offerings off the back of it.

[Government; UK]

London Waste and Recycling Board's Circular Economy Route Map

sets the vision for London to be a circular city. To create the right conditions for a circular economy to flourish at scale, LWARB has identified areas where it can play a lead facilitator role. This includes facilitating collaboration between businesses, public sector and academic, consulting on policy, providing business support to help companies adopt or expand circular models, and critically, coordinating investment support to help SMEs scale circular economy solutions.

5.1 Case study #1: Retrofitting social housing to 2050 energy efficiency standards

Lead organisation: **Nottingham City Homes**

Tags: *open innovation process, align incentives, design for scale*

The challenge

To radically improve the energy efficiency of housing stock, in order to cut environmental impacts to zero and alleviate fuel poverty.

The solution

Nottingham City Homes (NCH) selected 10 homes in Nottingham as part of a UK pilot to address these challenges using the **Energiesprong model**.²³ The model involves retrofitting homes to a 2050 standard. The retrofits are largely manufactured off-site so that costly and disruptive on-site work is kept to a minimum. The financing model is also innovative. Residents pay a flat fee of £50 into a monthly Energy Services Plan. Part of this fee goes towards covering the cost of energy provided, as well as the up-front refurbishment costs incurred by NCH. Crucially, NCH can use the remaining money to fund the refurbishment of other properties.

The innovation

- 1. Deep engagement with users.** NCH, alongside Nottingham City Council, worked closely with residents in the pilot to understand what they wanted - not just homes that were warmer and cheaper to run, but also that works could be carried out with minimal disruption for them, that they get flexible usage of space within the homes, and that they would be able to save on their energy bills going forward.
- 2. Innovative procurement process.** These considerations were included alongside the energy performance requirements as a broad set of outcomes laid out in an invitation to tender in January 2017. Bidders were set a target of coming up with solutions that didn't exceed more than £65k per property. NCH then entered into competitive dialogue with 3 shortlisted bidders, each of whom were given a budget of £10k to come up with their solutions. Melius Homes, an SME, was chosen as the right provider, and has the option of working with NCH on a further 400 homes following the pilot.²⁴
- 3. Designed to scale.** The funding model aligns the interests of residents with the Council's broader aim of making the city's built environment fit-for-purpose. Critically, the funding model also paves a way forward for the programme to be scaled across homes owned by NCH (though the ability to also extend to private homes will be key going forward).

5.2 Case study #2: Citizen-powered renewable energy in local communities

Lead organisation(s): **Repowering London** and **Energy Garden**

Tags: *leverage assets, co-creating solutions with users, design for scale*

The challenge

Local communities face rising energy and food costs. They typically lack control or involvement in the production of either of these and consequently awareness of environmental impacts is also low.

The solution

Repowering London co-develops community energy programmes alongside community groups and local authorities. Solar panels are installed on the roofs of social housing blocks, providing local communities with a cheaper source of renewable energy.²⁵ Likewise, Energy Garden works with Transport for London and other partners to transform London Overground platforms into thriving gardens that incorporate food-growing plots and solar panels to provide on-site renewable energy.

The innovation

1. **Leveraging under-utilised assets.** Both organisations tapped into physical assets owned by the public sector that were under-utilised to create value. Repowering London works with local authorities to identify areas that could host a solar PV installation. For Energy Garden, it was unused platform space on the London Overground network.
2. **Co-creating with service users.** Apart from providing affordable, clean energy to local residents, Repowering London supports local communities to deliver, own and manage the energy projects, helping individuals to learn new skills (that potentially lead to employment), as well as connecting the community in new ways.
3. **Shared ownership enabling scale.** Repowering London leverages investments in small increments (minimum £50) from local residents to pay for the up-front costs of each project, subsequently generating income from Feed-in Tariff payments and the supply of discounted electricity to local residents. This allows investors to receive a 3-4% return on their investment, whilst generating a reliable surplus that can fund future projects.

5.3 Case study #3: Driving economic growth around climate innovation²⁶

Lead organisation: **Energy Capital** (a partnership anchored by Birmingham City Council alongside other partners from academia, industry and the public sector, catalysed and supported by **Climate-KIC**).

Tags: *define an MTP, aggregating demand, co-creating solutions with users, design for scale*

The challenge

Birmingham City Council compared the impact of its energy sector with those of five other city-regions in Europe – leading it to realise that whilst Birmingham was home to a wide variety of energy projects and actors, it lacked a clear focus and organisational lead. There was a heavy reliance on external funding for projects, and the heavily centralised system represented lost opportunities for the local economy.

The solution

Birmingham City Council set up Energy Capital which outlined a clear, long-term vision for energy within the city, and adopted a collaborative approach towards driving down carbon emissions across different areas such as buildings, energy and mobility.

The innovation

- 1. Aggregating demand across the West Midlands.** Energy Capital aims to make the West Midlands one of the most attractive locations to build innovative clean energy technology companies in the world, providing a single point of contact for investors, project funders and potential partners across the West Midlands.
- 2. Engaging SMEs according to their strengths.** Early on, Energy Capital put on an energy-themed open innovation challenge, inviting businesses and researchers from across the region to apply their minds to real energy challenges in the West Midlands, with a view to bringing SMEs into different work streams of Energy Capital.
- 3. Addressing institutional silos.** In March 2018, the West Midlands Regional Energy Policy Commission (convened by Energy Capital and funded jointly by the Energy Systems Catapult and the University of Birmingham, Birmingham Energy Institute) launched a **new report** making the case for the creation of Energy Innovation Zones (EIZs) across the region. The proposal is for each EIZ to create a risk-managed and commercial-scale context for the development of new local clean energy markets, overcoming institutional silos that traditionally separate functions such as transport, digital, planning and energy within a geography.

Annex A | Urban challenge #1: Improving air quality

Air pollution is one of the biggest killers on the planet. In the UK, toxic air levels consistently exceed the legal air pollution limits in many urban areas. Some 40,000 early deaths a year in the UK are attributed to poor air quality.

Air pollution in the UK is largely linked to road traffic. This includes both nitrogen dioxide (NO_x) – most associated with diesel vehicles, although petrol vehicles also emit NO_x – and particulate matter (PM₁₀ and PM_{2.5}). The latter is in part caused by tyre and brake wear, so is an issue even with electric vehicles. Other sources of NO_x, PM₁₀ and PM_{2.5} include aviation, trains, gas boilers, farming, construction and wood burning.

More [recent research](#) shows that domestic use of products like household cleaners, paints and perfumes with high levels of “volatile organic compounds” also contribute heavily to urban air pollution.

The legal NGO ClientEarth has successfully sued the UK Government three times over its air quality plans. The [latest ruling](#), in February 2018, saw the Government instructed to ensure that 28 local authority areas in England, in addition to the Greater London Authority, take steps to “achieve compliance as soon as possible, by the quickest route possible, and by a means that makes the outcome likely”.

The target is for local authorities to set out their local action plans by the end of 2018, and subsequently, meet legal and World Health Organization (WHO) requirements for NO_x concentration levels by 2020 and 2030 respectively.

A deeper analysis of Air Quality as an urban challenge can be found [here](#).

Breakthrough Cities Workshop in Nottingham, UK (November 2017)

Roundtable topics

- **AirNode (Gordon Rates)**
How do we link Air Quality regulation and mitigation to actual citizen experiences of low Air Quality?
- **Liftshare (Sergio Aguilar & George Beacock)**
How can we drive down the number of single occupancy cars on city roads?
- **Riversimple (Stafford Lloyd)**
How can we address the pain points associated with adopting low carbon vehicles?
- **Ferrovial (Mark Saunders)**
How can we link the cost of improving Air Quality to the benefits of having good Air Quality?
- **BetterPoints (Dan Gipple)**
How do we collectively motivate people to think and care about Air Quality?
- **Enquiring minds (Nick Allott)**
How can we more intelligently manage indoor Air Quality using existing systems and data?
- **Blaze (Philip Ellis)**
How does a local authority make sure a bike share operator is a responsible partner?

Annex B | Urban challenge #2: Healthy ageing

By 2050, almost one in four people in the UK will be at least 65 years old. One in three children born in the UK today can expect to live to 100. As the UK population ages and individuals begin to live significantly longer, new business models and cross-sector partnerships are needed to deliver services and products that make healthy ageing a reality for all.

At the same time, this change in demographics will create an increasing demand for new products and services. In the UK, the over-50 population holds almost 70% of household wealth. Across the EU, over-65s have a spending capacity of €3 trillion.

As outlined in the UK Government's Industrial Strategy white paper, four priority areas have been identified for the UK to extend its leadership in innovating to meet the needs of an ageing society. These are:

1. Fostering new products and services for the growing global population of older people
2. Adapting to a changing and ageing workforce
3. Leveraging data to improve health outcomes
4. Enabling care providers to adapt their business models to changing demands

Announcements in March 2018 include a £300m investment by the Government from the Industrial Strategy Challenge Fund towards healthy ageing. This includes £98m to drive the development of new products and services that will help people to live in their homes for longer, tackle loneliness, and increase independence and wellbeing.

Further context on the Ageing Society as a grand challenge is outlined in the UK Government's **Industrial Strategy white paper** (pages 52-55).

Breakthrough Cities Workshop in Newcastle, UK (January 2018)

Roundtable topics

- **National Innovation Centre for Ageing (Michael Catt)**
How the National Innovation Centre for Ageing can work with businesses in bringing new products and services to market.
- **Aging 2.0 (Eric Kihlstrom)**
How can we work across entrepreneurs and other stakeholders (including owners of consumer data) to share and use non-NHS data to support older people?
- **Newcastle University Living Lab (Rob Wilson)**
What might a new marketplace / platform that seeks to solve the challenges of a fragmented ageing market look like?
- **Carers UK (Madeleine Starr)**
How can we enhance the functionality of our care-coordination app, Jointly, to include targeting health conditions and as a hospital discharge tool?
- **Tesco (George Gordon)**
How do we use the community spaces in large supermarkets to support older people through partnerships?
- **North East Local Enterprise Partnership (James Davies)**
How do we identify new opportunities for alignment across businesses in the health and digital sectors, and overcoming challenges?
- **Transmit Enterprise (Robert Webb & Andy Cox)**
Developed Signal, a tech-based, multi-dimensional survey platform on individuals/households, providing potential co-production opportunities with care providers. How might other organisations use this to enhance their engagement with users?
- **Academic Health Science Network (North East & North Cumbria) (Dave Belshaw & Rachel Turnbull)**
How do we encourage take-up of electronic record-keeping solutions amongst care homes?

Annex C | Urban challenge #3: Sustainability in the built environment

According to a 2016 World Resources Institute report, buildings are responsible for nearly 40 percent of global energy use and 25% of global human-induced CO2 emissions. At the same time, the economic lifespans of our buildings are also far longer than other things we might invest in – at a minimum around 40 years, and up to 120 years (or even longer). The way we design and build therefore has long-term implications.

The benefits of making buildings more efficient go well beyond the environment. It can improve the quality of life for residents, creating opportunities for better health and productivity. Low-income residents can also benefit from spending less money on lighting, heating or cooling.

And yet, the average energy consumption per person in the global building sector still remains practically unchanged since 1990. A McKinsey 2016 report reveals that the construction industry is among the least digitized of industries. The way in which we create our buildings has not changed substantially in 40 years.

In the UK, Transforming Construction has been identified as one of the challenges in the Government's Industrial Strategy. The opportunity here is to create more affordable housing in a way that doesn't harm the environment.

In November 2017, the UK Government announced that it would invest £170m in the Transforming Construction programme, with industry committed to match-funding with a £250m investment. One objective of the programme is to achieve a 50% reduction in greenhouse gas emissions in the built environment by 2025.

Breakthrough Cities Workshop in London, UK (March 2018)

Roundtable topics

- **Advance London / London Waste & Recycling Board (Natalia Agathou)**
How can local government best promote circular businesses? And how should we define circular, anyway?
- **Apolitical (Jake Morgan-Stead)**
What can be done to decrease the barriers that SMEs face in engaging government before the procurement stage? Join Apolitical²⁷ to codesign a 10-point “manifesto” for how government and local businesses can work together better.
- **B Lab UK (Kate Sandle)**
Can B Corp certification (where companies take responsibility for, and meet rigorous standards of social and environmental performance, accountability and transparency) help validate companies as a force for good, and enable SMEs to better collaborate with the public sector in line with the Social Value Act?
- **Camden Council (Fiona McKeith)**
With a pipeline of over 2000 homes to build, Camden Council is looking for modular solutions and sees an opportunity to be part of a supply chain that enables real innovation in this emerging market. Our challenge is about procurement: how to compare systems, identify precedents and incentivise innovative solutions?
- **Climate-KIC (Brian Kilkelly)**
Accelerating action: how do we stop the circle of waiting? Europe is littered with promising pilot projects that successfully demonstrate ways we can transform our buildings and cities. But scale is not being achieved. We need to increase the rate of carbon reduction by a factor of 6 every year until 2050 to stay within 2 degrees of warming.
- **Croydon Council (Marion Cugnet)**
How can we minimise the carbon footprint of Croydon's massive town centre regeneration programme, incorporating circular economy and “waste-as-resource” models?
- **Energiesprong UK/Miller-Klein Associates (Jon Warren/Richard Miller)**
How can we make deep, whole-building retrofit for energy efficiency a ‘no-brainer’ for building owners?

(cont.)

- **Greater London Authority (Nusrat Yousuf)**

How can city authorities best help to aggregate demand for SMEs and/or help them connect with the market? What are the best models out there? What can we learn from the successes and failures of other cities?

- **Old Oak & Park Royal Development Corporation (Dan Epstein)**

OPDC is the biggest regeneration project in the country. You are invited to help map an approach that will promote the use of cleantech innovation to meet OPDC's goal to be zero carbon, zero waste, zero emissions and a climate adapted development.

- **TfL (Gavin McLaughlin)**

How can we use Travel Plans (a strategy for managing the travel generated by a property development, with the aim of reducing its environmental impact) to shift more journeys from private vehicles to active travel and public transport?

Annex D | Collaboration between city authorities and SMEs: common challenges

Negative stereotypes.

One of the most important outcomes of getting SMEs and city authorities in the same room is the shattering of stereotypes about “bureaucratic” public servants or “unreliable” entrepreneurs. The lack of an established track record amongst SMEs can also make working with them less attractive compared to larger companies. The persistence of such negative stereotypes remains a significant barrier to collaboration and the dismantling of silos.

You only know what you know.

As city authorities attempt to tackle complex challenges, they know they need to look beyond the “usual suspects”. But the emerging solutions space among SMEs is fragmented and disparate, making it difficult to find the best solution to a challenge. Sometimes, the right solution might not even exist yet.

It's nobody's and everybody's job.

Urban challenges often involve a complex web of stakeholders. Downstream costs are borne by a multitude of stakeholders including city authorities (from local councils to other public-sector organisations such as the NHS), individual citizens and private sector firms (e.g. insurers). It's nobody's job to do system innovation.

Fear of admitting failure.

City authorities are often risk-averse for good reason: they're responsible for public money and public welfare. But, what we also heard from several participants is that fear of being seen to fail can lead to perverse outcomes. Rather than killing off bad ideas and starting again, city authorities sometimes persist with projects that deliver sub-optimal outcomes because of the taboo around failure.

Lack of time and space for pre-competitive collaboration.

Early conversations between prospective partners are key to consortium building, but it's difficult to make time for such engagement. We also heard concerns around the need for a “safe” space where SMEs could share ideas without putting their IP at risk and where city authorities can engage with SMEs without favouring particular providers unfairly.

Short-termism.

Limited resources often mean that “painkiller” solutions, which prop up the status quo, are preferred over “vitamin” solutions that address the root causes of the problem. In procurement, there is a tendency to favour the lowest-price solution, regardless of whether alternatives are available that could deliver better outcomes over the longer term.

Death by pilot.

A common refrain from both SMEs and city authorities was frustration at the sheer number of pilot projects that fail to scale. Sometimes the cause is lack of funding, sometimes lack of capacity to scale on the part of the provider(s). Either way, too many pilots absorb a disproportionate level of resources from all involved and don't deliver a good return on investment.

A business model framework for solving urban challenges



8.0 End notes

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¹² The term Massive Transformative Purpose was coined by Salim Ismail et al in the 2014 book, *Exponential Organizations: why new organizations are ten times better, faster, and cheaper than yours (and what to do about it)*. You can read more about what the term means [here](#).

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9.0 Further resources

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Other organisations and collaboration platforms

Global / regional

- Apolitical, a live, global platform with examples of multi sector policy innovation and a corresponding policymaker network: <https://apolitical.co/>
- Citymart, a platform that connects city government employees to solutions: <http://www.citymart.com/>
- EIT Climate-KIC, a European knowledge and innovation community that aims to accelerate the transition to a zero-carbon economy: <http://www.climate-kic.org/>

UK-wide

- GovTech Catalyst, a new service aiming to connect small, emerging technology businesses with fresh solutions to public services: <https://www.gov.uk/government/news/the-first-govtech-catalyst-competition-launches-today>
- Future Cities Catapult, brings together businesses, universities and city leaders to accelerate urban ideas to market: <http://futurecities.catapult.org.uk/>
- Innovate UK Small Business Research Initiative (SBRI), provides a process to connect public sector challenges with innovative ideas from industry: <https://sbri.innovateuk.org/>
- Knowledge Transfer Network, the network partner of Innovate UK, links new ideas and opportunities with expertise, markets and finance through its cross-sector network: <https://ktn-uk.co.uk/>
- PUBLIC, helps startups to transform the public sector: <http://www.public.io/>
- The Public Sector Transformation Academy, designs and delivers development programmes to build capacity to transform public services: <https://www.publicservicetransformation.org/>