Joining the dots: a new approach to tackling the UK's infrastructure challenges

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Aerial view of London at night

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Foreword

Politicians love to talk about infrastructure. Hard hats and hi-viz vests are a staple of election campaigns from Argentina to Zambia. This prominence is a testament to the political and economic symbolism of investing in infrastructure –new projects can be a source of national and regional pride, while clogged roads and packed trains can spell disaster.

The UK urgently needs to invest in new infrastructure. Our transport network is dirty and over-crowded, housing too expensive and often in dangerously poor condition, and the regional imbalance of our economy grows by the day.

A concerted and well-designed investment programme could play a huge part in addressing all of these challenges but the systems we have in place are not fit-for-purpose: without substantial reform we risk repeating the mistakes of the past.

With this in mind, the Royal Institute of British Architects has spent the last 12 months looking at how we plan, design and build infrastructure projects in the UK to assess how well we are doing it and what we can do to ensure that the situation is improved. Our research revealed a startling picture: while politicians from all parties recognise the need for more investment, just adding more money to the current system would be an indefensible waste of resources.

With the decision-making process focused in Westminster, the lack of resources and accountability at a local level has meant that those with the power are too disengaged to take action while those who care have no means to effect change. Rather than building new roads, airports or rail links, we've become world leaders in carrying out consultations, debates, establishing independent commissions, all to find novel ways of delaying making decisions. And when we do manage to get shovels in the ground, the schemes we build are too often shaped by impact assessments which ignore important external considerations like jobs, housing, social inclusion and public services. While this is depressing, it also leaves a lot of upside available if we can get this right.

To address this, the RIBA argue that the UK needs a new approach, addressing the bigger picture, while simultaneously thinking local. Above all, we need to rethink what we think we know. We need to do all of this while extending a level of trust to local and regional actors that has been sadly lacking for decades. The collapse of the Berlin Wall should have signalled the end of the command economy in Europe, but this message never reached the Treasury.

I hope that politicians and civil servants will consider these recommendations and examine whether the systems they currently use can deliver the investment that this country urgently needs.

Ben Derbyshire
President RIBA

Executive Summary

Outdated, overcrowded and at times non-existent – shortcomings in the UK's infrastructure networks are doing enormous damage to our economy and society. The problems are often decades in the making. Putting things right starts with a fresh approach, supported by sustained investment.

Enhancing the UK's global competitiveness is about far more than just infrastructure. However, at a time when the UK needs more than ever to present itself as a great place to live and invest, tackling the infrastructure crisis is of paramount importance. This will not be easy or cheap, but without a new deal and a new approach to building new roads, railways, homes and workplaces, attempts to tackle the issues that are holding this country back will be fatally undermined.

In *Joining the Dots,* the RIBA sets out a new roadmap for infrastructure decision making and delivery with recommendations focussed in three areas:

- **Cultural changes** that can address the delays and underinvestment created by the current decision-making process;
- **Operational changes** needed to address the deficiencies in our current approach to design and assessing projects;
- **Delivering good design** through better policies.

Most of us take the infrastructure that underpins our lives for granted, only sitting up to take notice when things go wrong. This understandable and unwitting short-termism has helped shape the political debate about infrastructure for decades by driving an approach that focussed investment around a narrow set of political objectives.

Faced with a range of economic, social and environmental challenges all competing for public attention and resource, the time has come to recognise that the status quo is broken. Our report does not seek to blame the Treasury and other Government departments for the housing crisis, gridlocked transport networks or the UK's uncompetitive energy and communications infrastructure. The causes of these problems are many and broad and arise from a lack of leadership at all levels. The problems will not be solved without a radical rethink of how we plan, design, deliver and maintain new infrastructure.

Joining the Dots makes 20 recommendations which can help to address the problems in the current approach and push the UK towards a longer-term, more expansive and more flexible approach to planning new infrastructure. We have reached a point where rather than being engines of growth, the UK's housing stock and our transport and communications infrastructure represent one of the biggest barriers to prosperity and a huge driver of regional and local inequality. If we want to change this, we need to change how we think.

Change is already underway. The establishment of a National Infrastructure Commission is an important statement about the need for a new system. But it isn't enough to just tweak around the edges. A more wide-ranging set of reforms is needed. Our recommendations to Government fall into three categories:

First, the need for urgent and deep-rooted **cultural changes** to address delays and under investment created by the current decision-making process. The system of cost/benefit analysis, which underpins much of the current system, is broken. It has led to too much time spent justifying decisions, rather than researching options. It has also meant that we have failed to learn from completed projects –a much better approach to measuring and then acting on the lessons is needed.

Next, we focus on the need for **operational changes** to address deficiencies in the way in which we currently design and assess projects. Without more cross-departmental analysis, better tools for capturing and incorporating local expertise and an end to the centralised system making decisions on local schemes, the prospects for reform look bleak. As our report makes clear, while individual reforms could improve the situation, they can deliver far better value for money if they are delivered within a broader reform agenda. In particular we argue for more flexibility around funding social housing, the need for reinvigorated and empowered local and regional leadership to drive forward changes and a national spatial strategy that allows local and regional plans to coexist effectively.

Finally, we need to build **on the things that we know drive good design** by including compulsory requirements for design quality in technical documents. Public bodies should be required to set out ambitious design visions for the projects they commission and a national design panel for national projects and an evidence base of 'what works'.

In the RIBA's view, it is not just a question of spending more on infrastructure (although it is clear that this is the case in many areas) to maintain and enhance the UK's global competitiveness. The UK needs to spend money more intelligently. Rather than micromanaging investment from London, a new process is needed that engages with users on a local, regional and national level and ensures that local needs are met while simultaneously maximising growth at a regional and national level.

This will not be easy, but if done right, can deliver a lasting legacy of change and prosperity.

Recommendations

Generating the right options

1 Focus on generating options rather than justifying decisions

2 Early cross-departmental cooperation to enable integrated strategies to be properly considered alongside individual schemes

3 Ensure local knowledge is integrated into option consideration and analysis

4 Set clear objectives and identify evaluation criteria before commencing construction

5 Continuously collect and share data on operational projects using accessible formats

6 Use strategic modelling (such as Integrated Urban Modelling and Foresighting) to evaluate options early on, across multiple outcomes

The right framework for decision making

7 Require spatial plans to reference all relevant plans in their area

8 Clarify how Strategic Economic Plans and neighbourhood plans relate to local plans

9 Public bodies across appropriate market areas should be required to agree a statement of common ground in relation to infrastructure before funding is made available

10 Local authority planning departments should have funding ring-fenced

11 Initiatives to boost the planning profession should be supported such as the recently-launched Public Practice, a scheme for planners along the lines of Teach First and Frontline

12 CPO compensation should be set at existing use value, with an additional premium provided to compensate land owners

13 The Housing Infrastructure Fund should be expanded

14 Local authorities should be permitted to pool and co-ordinate locally generated housing and infrastructure funding streams

15 Strike new devolution deals until there is a solution in place for every area of the country

16 Create a pathway to deepening devolution deals to ensure powers can be at least as extensive as those held by the Greater London Authority

17 Develop a National Spatial Strategy to create a framework which aligns infrastructure and economic development with housing growth

Promoting good design

18 Include compulsory requirements for design quality in technical documents, such as the Design Manual for Roads and Bridges

19 Public bodies delivering large infrastructure projects should set out ambitious design visions, which apply across the sites in which they are involved with

20 The National Infrastructure Commission should establish a national design panel and build an evidence base of 'what works'

Chapter 1

The case for change

Growing demand, changing expectations and under-investment have created a climate of growing public concern about the state of the UK's infrastructure. Some of the problems are obvious – commuters stuck on overcrowded and delayed trains, traffic congestions and toxic air in our cities and unreliable, slow and expensive broadband. Other impacts are harder to see, from the the growing housing crisis, gaps in regional productivity, and the challenge of accommodating an ageing population. Coupled with concerns about the impact of climate change and uncertainty about what Brexit will mean for the UK, the need for timely action has never been higher.

Our analysis shows that while awareness of the systemic nature of the problem is growing, the urgent need for change has still not hit home. Our report sets out reforms that we believe will create a broader and more holistic approach to infrastructure investment.

The UK's infrastructure has failed to keep up with demand; undermining economic productivity and damaging health and wellbeing.[AB] The problem goes beyond a simple lack of investment. The focus on headline grabbing mega projects at the expense of less newsworthy local infrastructure projects has left the UK facing a huge range of challenges at a time when resources are scarce.

There is now a welcome cross-party consensus that substantial investment will be required to address these problems. But simply adding more money to the current system won't be enough. If we want to maximise the economic and social impacts of public spending and ensure that new infrastructure is to be of lasting quality, then significant structural reform to infrastructure decision-making is required.

The impacts of the UK's infrastructure problems are hiding in plain sight.

Inadequate infrastructure is causing significant damage to the economy. A recent estimate put the annual cost of congestion on major roads to be over £9 billion[1], while disruption from flooding costs a further £1 billion every year.[2] But infrastructure also carries a significance beyond economic trends: it shapes the kind of society in which we live and the quality of life of those who live here:[C]

- **Inadequate infrastructure is making our housing crisis worse**. Poor connections to telecommunications, transport, and water services mean that potential sites for housing remain undeveloped because they are unviable or politically challenging to bring to market.[3] A lack of road capacity is one of the biggest factors generating opposition to new homes with 73% of objectors citing the potential impact upon local roads.[4] The costs associated with addressing infrastructure constraints has a knock-on effect on the amount of money that can be spent on the design quality and affordability of new homes.[5]
- **A lack of cycling and walking infrastructure is damaging our health and local high streets.** Cycling and walking infrastructure is often overlooked as a priority for national investment despite the fact that on average the economic and social benefits are higher than those associated with local road schemes.[6] There are range of reasons for this, including the increased footfall in retail and leisure outlets that can result.[7]
- **Our ageing population is often poorly served by existing infrastructure because it is not designed to address their needs.** Older people often find it difficult to access health services, finding public transport provision inadequate to meet their needs. They are also particularly likely to gain from 'active travel', in terms of reduced rates of both physical and mental disease.[8]
- **Poor design decisions make infrastructure frustrating and unappealing to use.** The design quality of infrastructure has a significant impact on those who use it, as well as its durability and functionality. Transport for London (TfL) found that the quality of built environment shapes travellers' perceptions of journey times.[9]

A Where not explicitly made clear otherwise, 'infrastructure' in this report refers to physical infrastructure, relating to transport, water management, waste, telecommunications and energy.

B This report focuses primarily on England. However many of the points made apply to other parts of the United Kingdom.

C For a more comprehensive literature review of the social, economic and environmental benefits and costs associated with infrastructure provision, see Space Syntax, *How Infrastructure Can Better Support Place Making and Other Policy Objectives* (London: Space Syntax and RIBA, 2017).

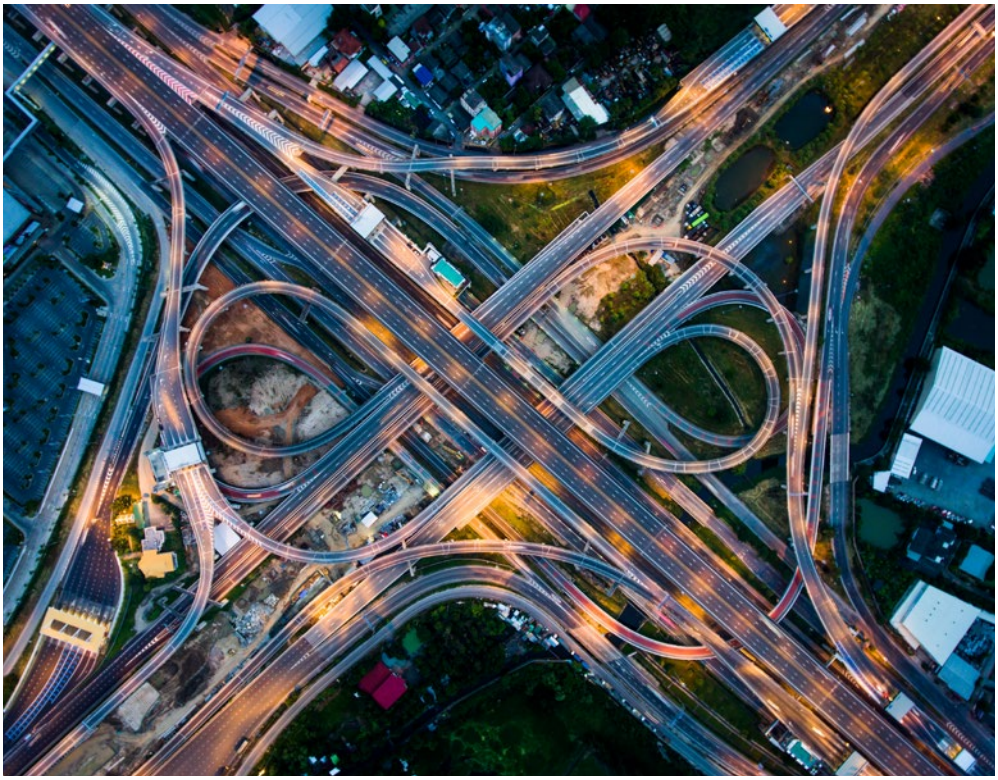
New approaches to planning infrastructure investment have been emerging, but a more inclusive strategy is needed to tackle wider economic issues.

Strong decision-making processes are vital if we are to make the right decisions about where to invest and how new infrastructure projects can best support a range of public policy goals. They are also crucial to address regional imbalances in public spending. In 2016 public investment in infrastructure in London was ten times higher than in North East England on a per person basis.[10] Given these imbalances it is not surprising that we find ourselves grappling with a significant and growing regional productivity gap.[11]

The good news is that change is beginning to take root – most significantly in the form of the National Infrastructure Commission. Set up in 2015, it seeks to provide impartial, expert advice on major national and regional long-term infrastructure challenges alongside a strategic vision for the next 30 years.[12]

Devolution to Combined Authorities offers the potential strategic decision to be made about infrastructure at the right level. It also enables integration of infrastructure with other policy areas, such as health and housing. Significant funding has been released to support the new Metro Mayors and invest in their transport priorities, most recently granting them half of the £1.7 billion Transforming Cities Fund.[13]

A third policy initiative is the Industrial Strategy, which aims to improve productivity by tackling underlying structural weaknesses in our economy.[14] In late 2017, the Government increased the funding for investment in transport, housing and digital infrastructure to £31 billion through the National Productivity Investment Fund.[15]



Wide-ranging reforms can transform the public and political discussion relating to infrastructure by addressing the issues responsible for delays and public opposition.

To better understand the strengths and weaknesses of the UK's current approach to infrastructure decision making and delivery, the RIBA embarked on a programme of research during 2017. We held roundtables in Liverpool, Cambridge, Nottingham and London to learn from local stakeholders how Government policy was playing out on the ground. The attendees included representatives from architects, developers, local authorities, and public bodies such as Network Rail and the National Infrastructure Commission. Alongside this research, we also commissioned the urban planning, design and governance consultancy Space Syntax to review the evidence around the social and economic impacts of infrastructure, and to scrutinise decision-making processes.[16]

We found the institutional framework for infrastructure in the UK to be alarmingly dysfunctional. The work of the National Infrastructure Commission, and the benefits already accrued from devolution to the Combined Authorities are mitigating the damage, however, we are concerned that, without urgent reforms the transformative potential of current and future Government investment in infrastructure will not be realised.

TARGET SETTING

DATA COLLECTION

EVALUATION

In Chapter 2 of this report, we examine how infrastructure decisions are currently made. We argue that there are a number of major flaws, ranging from problem at the policy setting and option generating stage, to a lack of target setting, data collection and evaluation. In particular, we highlight the drawbacks of Cost Benefit Analysis when used in isolation.

In Chapter 3, we consider the structures and powers of public authorities with an infrastructure remit. Too often, local decision makers lack the tools or resources to meet the scale of the challenges they face, and find that they are working in tensions rather than in collaboration with each other. We recommend measures to encourage greater inter-organisational collaboration, and a deepening of the devolution agenda.

In Chapter 4, we set out our priorities for wider reforms to support the new decision-making models. Key recommendations include the benefits of regional and national spatial planning. A new approach could integrate new infrastructure developments between different spatial scales, and help link new projects more closely to other policy priorities such as health, housing, or employment.

In Chapter 5, we argue that achieving good value for money in infrastructure investment entails a close attention to design quality. We make recommendations for how the delivery of quality can be embedded in new projects, from large multiregional schemes like HS2, all the way down to local drainage systems and public lighting.

Designing a better decision making system

A new approach is required to how we set about designing individual infrastructure projects. It is clear though that in isolation this will not be sufficient. Without the appropriate supporting structures and resources in place, the UK will continue to find itself struggling to meet demand.

At present, the links between national level planning and local/regional decision making are not adequately developed. Even as this begins to improve, there is a critical shortage of resources and resource raising ability in local government that threatens to render progress at a national level moot.

Inertia, vested interests and the centralisation of power require a concerted reform programme.

During our research, a recurrent theme was the need to overcome deep-seated institutional inertia. If the recommendations we have made are to be implemented successfully, there is the need for general reform to the decision-making processes around infrastructure.

Scenario One is less ambitious, and while it could deliver significant benefits, the lack of scale and institutional reforms limits the scale and scope of improvement. The increasing prominence of regional bodies – particularly combined authority mayors – lends itself well to this model in the absence of national engagement.

Scenario Two would represent a sea change in how the UK plans, delivers and harnesses the results of infrastructure projects. As such, it would require a significant transfer of powers and resources from Whitehall to local and regional leaders with both a transitional period and policy support.

Place-based decision making checklist

	Regional	Urban	Neighbourhood
Health and Sustainability	Does regional scale transport infrastructure minimise air pollution and support sustainable transport modes?	Does transport infrastructure encourage active travel, reduce car-dependency and improve air quality?	Is walkable street-based development given priority over road development?
Access to housing	Does transport infrastructure align with and stimulate sustainable housing development?	Does transport infrastructure align with and stimulate sustainable housing development?	Does local infrastructure (eg street networks) facilitate high quality and safe living environments?
Reducing poverty and unemployment	Does transport infrastructure improve access to employment opportunities for all?	Is transport infrastructure affordable for all?	Does new transport infrastructure lead to severance?
Town Centre Vitality	Does transport infrastructure supply lively centres at multiple scales and, support multi-modal travel?	Are transport nodes integrated into the surrounding urban fabric?	Are transport proposals aligned with improvements to the public realm?
Local Economic Growth	Does transport infrastructure effectively link different local economies to help firms to access complimentary labour pools/supply chains and markets across urban areas?	Does transport infrastructure increase accessibility to more jobs, across a range of sectors and incomes?	Does the local street system and the organisation of public space encourage face-to-face communication and exchange (and hence support agglomeration economies)?
Local Issues			

If implemented these reforms would tackle a number of the problems we identified in this chapter. It would entail:

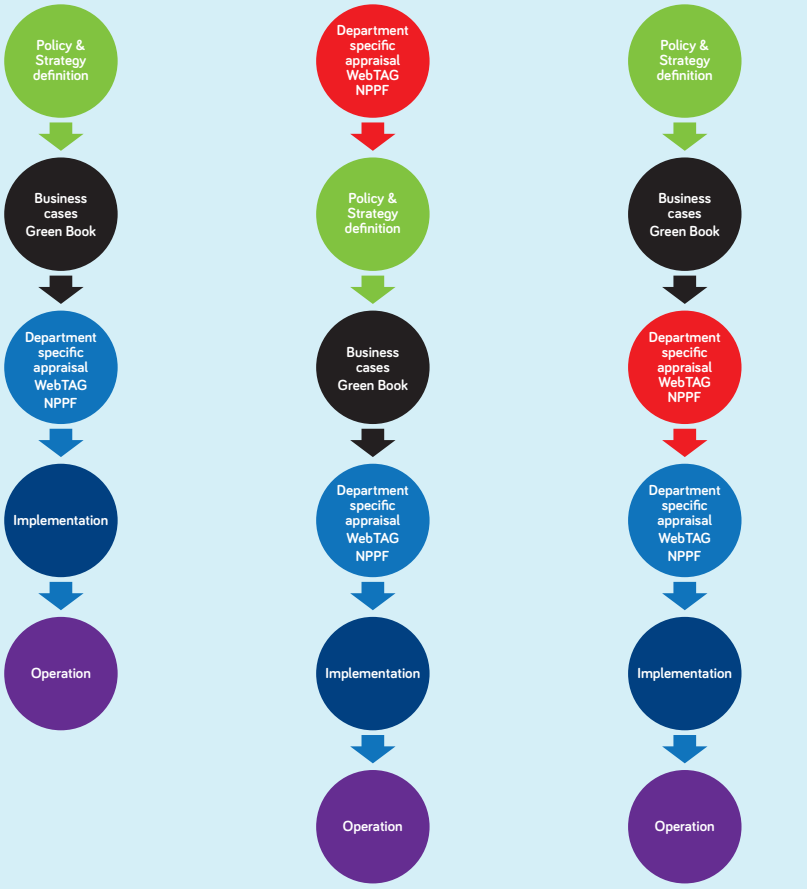
- Enhanced ability to generate options, and to 'think outside the box'
- The consideration of trade-offs at a number of spatial scales
- Long-term thinking, including a consideration of the dynamic effects of infrastructure delivery
- The opportunity to engage with local stakeholders in shaping policies from an early stage
- An appropriate forum in which to consider how proposed policies intersect with local aspirations and ambitions, including aspirations around design quality

Scenario One: Incremental Reform

Our first option would require no major reform of the structural framework under which public bodies operate. To tackle the weaknesses identified, we propose that foresight workshops are carried out very early in the decision making process, to help understand a problem in more detail and better shape objectives.

In the case of entirely new policy or projects, this should be carried out at the beginning of the process to help shape objectives and policy. In this scenario it could be lead and documented by the Local Authority and should include participants from different departments, disciplines and professions.

In the case of projects in development, it can be used as a proposal review at the point a statutory approval is sought, to help support the case for social, economic and environmental sustainability. In this scenario it could be lead and documented by the Practitioner delivering the project.



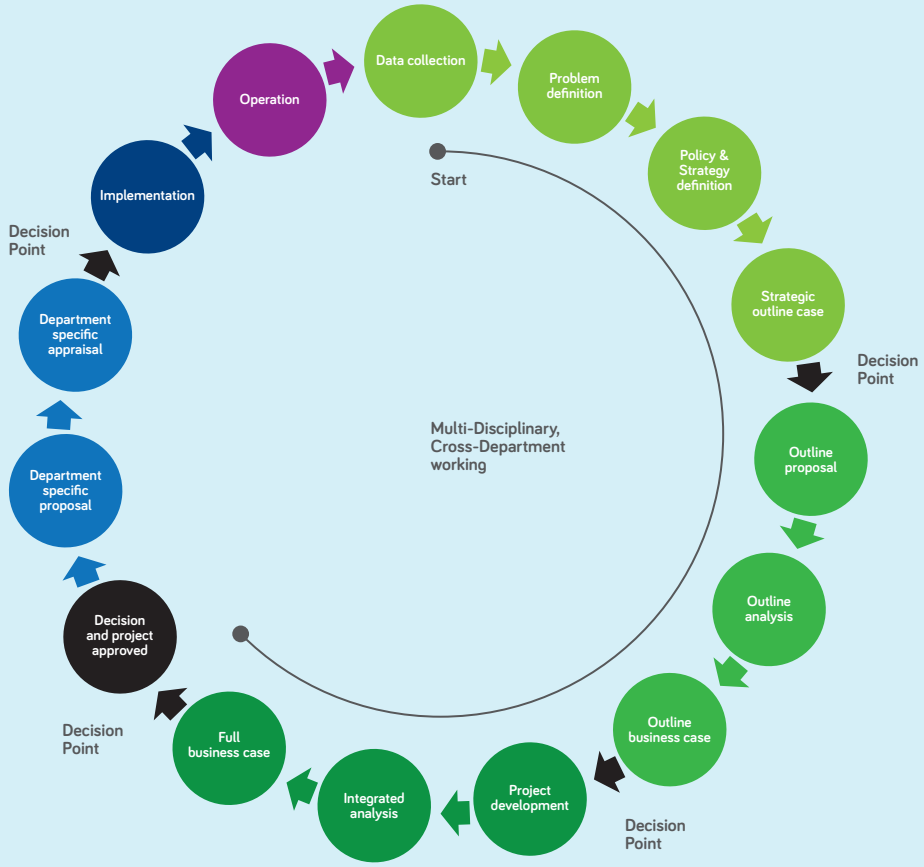
Current process

Place-based Foresight workshop applied within new projects

Place-based Foresight workshop applied within existing projects

Scenario Two: Transformative Approach

We also propose a more radical approach, which would systematically embed cross-departmental working, strategic modelling, and continuous evaluation and data collection.



The features of the approach are as follows:

- **Continuous data collection to set objectives, make decisions and evaluate projects.** This provides indicators of potential problems developing, data which can be analysed when studying an issue, and provides longitudinal data against which the success of a scheme can be evaluated.
- **Setting objectives.** Additional stages of analysis and problem definition are worked through before a policy objective is set. Options can then be developed on the basis of an improved understanding of the current condition –which should then be assessed in terms of outcomes across a wide range of indicators, rather than department or infrastructure specific priorities.
- **Strategic modelling for high level outcomes early on.** A range of outcomes for the people are considered (rather than just the impact on one system) to show the interactions between different infrastructure systems.
- **Working between departments.** This strengthens the potential for multiple benefits to be realised, such as unlocking land for housing.

A new approach is required to how we set about designing individual infrastructure projects. It is clear though that in isolation this will not be sufficient. Without the appropriate supporting structures and resources in place, the UK will continue to find itself struggling to meet demand.

At present, the links between national level planning and local/regional decision making are not adequately developed. Even as this begins to improve, there is a critical shortage of resources and resource raising ability in local government that threatens to render progress at a national level moot.

Chapter 2

How we make decisions today

Our research highlighted substantial shortcomings in the decision-making processes for infrastructure projects. Too often, short-sighted decisions saw long-term opportunities bypassed to meet short-term political or financial objectives.
The Cost Benefit Analysis process requires urgent attention as it heavily distorts both the planning and decision-making process.

One of the most striking things about our research was that, wherever we went, we heard stories of poor decision-making processes within the *existing* institutional structures. Whether the body in question was a central government department or another public body, we were repeatedly told of examples of short-sighted decision making and approaches.

Conversely, we found that too often, good decision making appeared to be reliant upon individuals who were willing to go beyond standard processes, challenge accepted wisdoms, and reach out to a wider range of stakeholders.

- **The UK's current approach to planning and delivering infrastructure rests too heavily on a narrowly focused cost-benefit analysis process which ignores broader social and economic outputs including new housing, employment and social infrastructure.**

Who currently makes decision about infrastructure projects?

A wide range of public bodies are involved in decision making about infrastructure each with their own strategic aims, including:

- Department for Transport (DfT)
- Ministry of Housing Communities and Local Government (MHCLG)
- Transport for London (TfL)
- Local Enterprise Partnerships (LEPs)
- Network Rail
- Highways England
- Water companies
- Local authorities
- Mayoral Combined Authorities
- Neighbourhood Forums and Parish Councils

What unites all these bodies is that they operate under a framework set out by the Treasury: the Green Book.[17] The Green Book sets a binding framework for all projects which require Government approval or funding.[A] The framework prescribes a process of action justification, objective setting, option appraisal, solution development, solution implementation, and evaluation.

At the heart of the Green Book is a Cost-Benefit Analysis model. Once problem-solving options for policies and programmes have been generated, the costs and benefits of each approach are quantified and assigned monetary values to enable direct comparisons of various options.

A Local Planning Authorities develop Infrastructure Delivery Plans in a process that is entirely separate from the one outlined here. They can fund their infrastructure priorities that are not currently in the pipeline through S106 contributions and CIL, or have them delivered directly by developers as part of S106 or planning conditions. However, if authorities require Government funding for projects, or for national public bodies to deliver infrastructure in their areas (which might be delivered through Highways England, for example), they will have to build a business case using the Green Book principles.

The Green Book makes clear that benefits should not be overlooked simply because they are difficult to quantify, or to assign a monetary value to. 'Non-market' impacts explicitly highlighted by the Green Book include: time-savings, health benefits, design quality, and environmental impacts.[18]

Where the impacts of 'good design' are difficult to quantify or to assign a monetary value to (such as where a well-designed station might increase civic pride or improve user experience), the Green Book encourages use of contingent valuation.[19] This entails directly asking people how much they would be willing to pay for a good or service, or how much they are willing to accept to give it up.[20]

In addition to the Green Book, each government department has its own additional appraisal processes. These align with the processes in the Green Book, but elaborate upon specific issues related to the work of the department. One of the most important is WebTAG (Web-based Transport Analysis Guidance), DfT's transport appraisal guidance and toolkit. It contains both appraisal and modelling components, including cost-benefit analysis, environmental impact assessment as well as demand and assignment modelling. At its core, WebTAG is concerned with journey times, with a particular focus upon journey times relating to business travel.

Finally, it is worth noting that, while the process for decision making about infrastructure is highly technocratic, political considerations also come into play. This may be at the beginning of the process, where Ministers or local politicians set broad strategic goals upon which civil servants or local authority officers develop and evaluate options. It may also be at the end of the process, when a Minister or local politician is presented with options by the civil servants and officers, but are ultimately responsible for making the decision.

Prescribing one rigorous, systematic method ensures public officials are held to account for their decision making. It guards against the danger of public money being spent on schemes with the most effective lobbyists, or whose promoters make the most outlandish claims of the benefits of their schemes. What is more, despite perceptions to the contrary, Cost Benefit Analysis can at least attempt to take into account 'intangibles' such as design quality and health benefits if the process is well designed.

Nevertheless, our research identified several weaknesses:

- Problems at the policy setting and option generating stage
- Drawbacks of Cost Benefit Analysis when used in isolation
- Inconsistent stakeholder engagement
- A lack of target setting, data collection and evaluation.


STAND
ON
THE
RIGHT
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No smoking
Stand on the right
No smoking

Chapter 3

What else should we look at?

We have the opportunity to create a more informed decision-making process – greater use of data and a more constructive local engagement process – but this will only happen if we are able to tackle the deficiencies in the current approach which restricts the scope of the decision-making process and places an undue level of importance in justifying the decision which has been taken.

While the UK's current approach to planning and delivering infrastructure projects is not without its strengths, it is also true that it has struggled to keep up with changes in the way we live and work. Some of these problems relate to high-level political decisions, which are covered in Chapter 4, others are more reflective of the narrowness of the current range of tools we use to assess projects.

- **A disproportionate amount of time is spent justifying the decision which has been made relative to the amount of time spent deciding on the best course of action.**
- **Reforms must increase the ability of decision makers to think spatially about solutions to infrastructure challenges.**

More focus should be given to the policy setting and option generation stages of the infrastructure planning process

Before examining the costs and benefits of policies and projects, goals have to be set and options generated. Typically, less than one third of the time spent on project development is given over to this 'front-end' of decision making.[21] But it is during this phase that decisions are taken that most shape what is subsequently delivered.

A number of commentators have raised concerns that there is frequently a lack of time to properly consider options at this stage. A 2017 study by the Institute for Government found that, in many cases, a preferred solution was settled upon far too quickly: '*the big fault line in projects [occurs] as you go from a nebulous policy idea into a specific project … often a nebulous policy idea has come up with a solution without fully understanding it*'.[22]

The Institute gives the example of the Tideway Tunnel.[23] They point out that it was decided early on that the answer to the strain on London's sewer system was a large tunnel. This was without properly considering alternative options, such as the use of sustainable drainage solutions. Later studies have since found that sustainable drainage systems would have been a far cheaper alternative.

And there is a further difficulty. Projects tend to arise from a single department or public body, which has its own priorities and its own understanding of the role of infrastructure. For example, transport infrastructure schemes generally aim to increase capacity or to reduce journey times, in line with the policy objectives of the Department for Transport. They are not necessarily conceived to address bigger picture issues like supporting communities, new housing, or the uptake of active travel.

RECOMMENDATIONS:

- **Focus on generating options rather than justifying decisions**
- **Early cross-departmental cooperation to enable integrated strategies to be properly considered alongside individual schemes.**

More should also be done in the early, options-generating stages to better understand how problems may be tackled (or worsened) at different spatial levels. There is a tendency to focus on the macro when it comes to large scale infrastructure investment. This may mean that micro-level effects and approaches are poorly understood or, as appears to be the case with Tideway, discounted early.

Real progress will not be made until we recognise that the current approach to assessing the impact of proposed infrastructure projects contains fundamental flaws

During our research we heard substantial criticism of the Green Book approach to Cost Benefit Analysis. Some stakeholders stated that that there appear to be problems inherent to the methodology prescribed; others said that the problem was in its interpretation and implementation.

We also heard specific concerns about WebTAG. In particular, there appears to be disproportionate bias towards journey times above all other considerations. Genuinely transformative opportunities to use infrastructure to support wider objectives such as the development of a new settlement or place making at a large scale can (and have) been discounted because it might increase journey times by as little as one minute.

These kinds of concerns about Cost Benefit Analysis were also recently raised by the National Infrastructure Commission. They highlighted that:[24]

- Cost Benefit Analysis does not currently support integrated planning for transport and housing
- Decisions can relate to changes which need to be assessed at system level, rather than in addition to existing capabilities. This is poorly handled in current Green Book approaches
- 'Concerns were raised that some valuations are poorly understood or measured; values are not always used even when available; and some important issues may not be capable of being valued at all with current techniques.'

We agree with these observations. Like all methods of analysis, the approach promoted by the Green Book has strengths and weaknesses. It is questionable how far Cost Benefit Analysis is useful when used in isolation to assess the 'intangibles' of design. The public might be surprised to learn that the Government may assess whether to invest in the design of their local station by asking people to put a monetary value on the public pride that might accrue as a result. It is a process that lacks all context.

Reforms must increase the ability of decision makers to think spatially about solutions to infrastructure challenges

Successful places are the result of a set of combined accessibility characteristics at multiple levels. Commentators talk of the need to work at three scales: the 'micro' may include pavement and curb design or the siting of railings; 'meso' may involve local neighbourhood accessibility to a station; while 'strategic' could relate to functional economic areas and labour markets.[25]

Areas can be strongly linked to infrastructure on a strategic regional scale but only weakly linked at the meso and micro scales. For instance, fast urban motorways without pedestrian infrastructure isolate rather than connect deprived communities.[26] There is a clear need to balance the positive benefits of regional connectivity with the potential negative impacts on local connectivity.[27] Schemes which boost regional connectivity can also reduce the walkability of a local area – even when well planned and designed.

As this suggests, infrastructure involves trade-offs. To take one obvious example: investing in a new road may reduce congestion and journey times for users. But it also has negatives. The cost to human health of exhaust fumes is considerable in the UK, and has been estimated at between £4.5 billion and £10 billion annually.[28] At the local level, this may or may not have an effect depending on where and how the scheme is delivered.

EXHAUST FUMES COST UP TO £10 BILLION PA

We therefore need to be thinking about infrastructure spatially: about how it interacts at different levels with the existing urban environment, the tradeoffs this entails, and the subsequent benefits from strategically bringing this thinking into the actual implementation of schemes.

Case Study: M6 Toll Road

The M6 Toll connects M6 Junction 3a at the Coleshill Interchange to M6 Junction 11A at Wolverhampton with 27 miles (43 km) of six-lane motorway. Users pay a toll to avoid congestion on the M6 through central Birmingham and the Black Country and have a congestion-free journey from the North-West to the South-East.

This makes sense as a funding model, but it means there is no fee for driving on a heavily congested motorway through the centre of a major conurbation with the attendant impacts on air quality, noise and light pollution and more broadly the health of those who live near the motorway.

If the scheme had been specified differently to deliver transformative benefits beyond simply improving journey times for strategic road users, it could have helped improve urban quality of life at a variety of spatial scales in one the UK's largest cities. If undertaken differently it could have taken large amounts of strategic traffic away from a major urban area and improved health outcomes; it may have removed the need for large flyovers and reduced severance effects (this would have been consistent with the city's policy to remove the elements of the city's inner ring-road).

Case Study: Nottingham Tram and the Built Environment

Nottingham Express Transit (NET) is a 32-kilometre-long (20 mile) tramway in Nottingham, England. The system opened in 2004 and a second phase, that more than doubled the size of the network, opened in 2015.

In the late 1980s, Nottingham City Council and Nottinghamshire County Council identified the possibility of using a modern tramway to stimulating urban renewal and tackle road congestion. Funding was made available by national government and in March 2000, the joint promoters, Nottingham City Council and Nottinghamshire County Council, awarded a 30-year Private Finance Initiative concession.

The new line proved successful, leading to an increase of public transport use for the Nottingham urban area of 8% in the five years to 2008, together with a less than 1% growth in road traffic, compared to the national average increase in road traffic of around 4%.

The line itself exceeded expectations, with 8.4 million journeys in 2004-5 and 9.7 million in 2005-6, against targets of 8 million and 9 million respectively. By 2007-8, ridership had reached 10.2 million journeys, which bolstered the case for the construction of new lines.

In parallel with the delivery of the tram network, built environment improvement projects have taken place, particularly in the city centre. One notable project, connected to the tram is the Old Market Square in Central Nottingham. This underwent major redesign work and was reopened in 2007 as an enhanced piece of built environment in the heart of the city.

This means that the tram system begins to connect into the multiple scales of city, linking city-scale connectivity into the more local scale of placemaking, at the scale of neighbourhoods and the design of the built environment. It is a demonstration of what thinking spatially at multiple scales can achieve.

Stakeholder engagement needs to be more than a tick box exercise to satisfy legal requirements if we are to maximise the benefits of investment

Throughout our research, we were regularly told of the benefits of close engagement with local stakeholders, including the public, civil society groups and local politicians.

Case Study: Cambridge Guided Busway

The Cambridgeshire Guided Busway connecting Cambridge, Huntingdon and St Ives in Cambridgeshire opened in 2011. It is the longest guided busway in the world.

2.5 MILLION TRIPS A YEAR

In many ways, the project is an exemplary demonstration of the wider public goals that can be delivered upon through well-considered infrastructure delivery. Alongside accommodating 2.5 million trips a year, it has unlocked an array of additional benefits, supporting the long-term growth of Cambridge. For instance, the busway has enabled the growth of new satellite settlements on the outskirts of Cambridge to grow more sustainably and support greater uptake of public transport and active transport with dedicated bus stops.

Northstowe is a new town development which aims to provide up to 10,000 new homes, on the former RAF Oakington airfield and barracks over a growth period of up to 25 years.

One of the most intriguing aspects of the scheme, however, is the story behind its complementary cycle path. Alongside the new busway there were always plans for a maintenance road to run alongside the full length of the track. But it was only after much campaigning by local cycling groups that this was turned into a public bridleway and dedicated cycling route, which runs almost the length of the entire busway. Part of the cost was funded by the Busway but there was additional funding from the local authority and local cycling charities.

85% INCREASE IN USE OF CYCLE PATHS

A number of studies have now found that improvements to cycle infrastructure around the Guided Busway accounted for both the increased uptake of public transport and cycle usage. One, which looked at people who lived within 30km of the city centre and travelled to workplaces in Cambridge along the busway route, found that exposure to the busway was positively associated with an increase in cycling. 85% of the reported increase in cycle use was attributed to use of the cycle path only. The results also show that people living closer to the busway were more likely to increase the time they spent cycling on the commute than those living further away.

Local stakeholders, who are embedded in the urban environment in question, can make substantial contributions to ensuring the most is made of new infrastructure schemes. Without local civil society groups raising the benefits of a cycle path, it is unlikely that would have gone ahead. Also, interestingly, engaging local stakeholders to see how infrastructure schemes can be enhanced can uncover new potential areas for funding.

Campaigning and political pressure can be used to unlock these benefits. But a far more productive approach would ensure that they are more involved in the actual process of decision making about new infrastructure schemes. Looking to the future, a better system of local engagement could also be used to set out the broader context of a development. Backed with better and more relatable information, project teams will be able to explain and explore the benefits of a proposals as well as setting out the impacts of a scheme not progressing.

RECOMMENDATION:

✪ **Ensure local knowledge is integrated into option consideration and analysis.**

Target setting, data collection and evaluation approaches need to change to reflect the need for greater transparency around outcomes

While the Green Book states that public bodies should evaluate their projects against set goals, this does not always appear to be happening in practice. Public bodies have developed good mechanisms for scrutinising cost, time and scale (i.e. 'on time and on budget'). However, we heard that they regularly dodge measuring projects against their initial targets. This may be due to ill-defined initial objectives, but could also be because the current system tends to value delivery above all else. In addition, the evidence base for understanding impacts of infrastructure delivery is poor. The literature review carried out by Space Syntax for the RIBA found a surprising lack of data on key issues such as the impact of infrastructure upon housing delivery and placemaking. Existing research is too often based on short-term outcomes, making it difficult to establish casual links. A recent review of 2,300 transport studies in the OECD countries by the What Works Centre on Local Economic Growth found that only 1% of studies met the Centre's minimum standards.[29]

Notwithstanding the difficulties in understanding the causality of infrastructure schemes, better evaluation of projects would underpin better analysis of their wider costs and benefits, and feed back to underpin better infrastructure decisions in the future.

Case Study: High Speed 1

High Speed 1 (HS1) is a 109-kilometre (68 mi) high-speed rail connection between London and the Channel Tunnel.

The companies bidding for the project made over-optimistic predictions about passenger growth on the Channel Tunnel in the 2000s. By 2004, the revised central case estimate was below both the most pessimistic cases in 1998 and 2001 'low cases'. The most recent re-evaluation by the NAO in 2012 found that actual passenger numbers between 2007 and 2011 were, on average, one-third of the level originally forecast in 1995, and two-thirds of the revised 1998 forecasts.

Once it became clear that the projected revenues were inaccurate, financing became much more difficult to secure and the Government was forced to step in and guarantee £3.7 billion borrowed to fund construction.

The project went ahead on the basis of wider objectives, including regeneration and 'national prestige' however the most recent evaluation estimates that it currently stands as a net loss to the taxpayer.

Two economic impact studies were commissioned in 2009 and 2015 to examine the effects of HS1. The primary focus of the 2009 evaluation was on cost and transport user benefits. While the evaluation did estimate wider economic outcomes, particularly those relating to regeneration, it was unable to come to any definitive conclusions about what impact HS1 had. Partly this was a result of an inability, or unwillingness, to set measurable targets for wider economic benefits at the outset. The evaluation was only able to go so far as to state that regeneration benefits were 'clearly important and formed a major part of the decision to proceed with HS1'.

The original plans for HS1 were that it would unlock substantial development opportunities in Stratford, East London and in Kent, particularly in Ebbsfleet and Ashford.

Stratford has been a success, with good public transport interconnections and an emerging centre. However, this is in large part, due to the substantial investment and development of Stratford for the 2012 London Olympics and the ongoing work of the London Legacy Development Corporation. It could be argued that HS1 played a role in the success of the development, but it is clear that it was not a critical factor to its success.

The Department for Transport only commissioned a full evaluation of the economic impact of HS1 following criticism from the Public Accounts Committee in 2012 that the government does not properly evaluate major projects, and therefore does not understand the wider economic impact of transport infrastructure compared with alternative options.

RECOMMENDATIONS:

- **Set clear objectives and identify evaluation criteria before commencing construction**
- **Continuously collect and share data on operational projects using accessible formats.**

To help increase the ability to understand the impacts of a proposed project, a broader range of option generation and analysis tools should be used

As we have seen, there are substantial drawbacks to the current approach to option generation and to Cost Benefit Analysis, when used in isolation. Here we highlight two alternative methodologies.

TOOL 1: INTEGRATED URBAN MODELS

An Integrated Urban Model (IUM) is strategic model combining street networks, public transport networks, land use, density and demographic data. IUMs can help decision makers understand how proposed infrastructure systems interact with each other.

An IUM is built using the street network as a base at the level of individual street. This allows the network to be analysed by itself, or with additional data. At the finest scale, this allows individual buildings to be linked to each other through movement networks, while at a coarser level spatial data can be aggregated up to LSOA or MSOA levels.

Case Study: IUM of Milton Keynes

Work by Space Syntax has included the use of IUMs at the scale of the country and at the scale of the city. For instance, an IUM was made for Milton Keynes to understand how their local transport plan would integrate with proposed growth at the city and regional scale.

Integrated Urban Model of Milton Keynes showing the car dependency of every household in the city based on a comparison of jobs within 30 minutes by car against access by public transport.

The model combined all modes of public transport, the road and pedestrian networks, land use, density and demographics. By measuring the way these infrastructure systems interact with each other it is possible to see how this makes certain travel behaviours more or less likely. By comparing access to jobs by car against access to jobs by public transport car dependence can be measured (typically private car use offers access to 3.0 –5.0+ times as many jobs). These results were compared to census data on commute to work mode and public transport mode share.

Because the model allows the flexibility to combine data collected at different scales, it means it can be combined with additional models that might be based, for example, on demographics. This allows risk stratification models to be run and overlaid on a city so that a combination of potential demographic and infrastructure risk can be identified.

The overarching finding from the work was that the current spatial plans which Milton Keynes has developed are unlikely to reduce car dependency or see an increase of public transport use over the coming decades without investment in public transport systems. In fact, the analysis showed that the way in which the city will develop is likely to further disadvantage people without access to a private car unless more can be done to improve the alternatives to car use.

The study should provide a basis on which the local authority can make future decisions about infrastructure improvements. It has already gone onto inform a report commissioned by the National Infrastructure Commission, which sets out a strategy for 'first mile' and 'last mile' connectivity for Milton Keynes.[30]

There are additional, emerging uses of IUMs. One area currently developing is around health and wellbeing indicators. Car dependence of parts of a city can be compared to the risk of social isolation (based on demographic data), income or deprivation data.

As an emerging type of model, IUM does not comply to existing standards which are developed around a different type of model and use (such as WebTAG), and therefore requires that a local authority takes a risk in using this approach

TOOL 2: FORESIGHT STUDIES

Foresighting is an evidence-based way of thinking about the long-term future. There are a wide range of foresight tools and methodologies and no fixed way of practicing foresight. However, it typically involves three main activities:

- The creation and consideration of a multidisciplinary evidence base about a topic, question or proposal;
- The creation and consideration of a range of long-term scenarios which are underpinned by the evidence base;
- The creation of new, diverse networks of people, often interdisciplinary experts from different professional, academic and personal backgrounds. These networks will use scenarios generated and their own expertise to test proposals and challenge conventional thinking.

The process can engage a wide range of stakeholders, including representatives from local authorities combined authorities, LEPs, the public, utilities, businesses, civil society organisations, universities, consultancies, and government departments. Those involved with a session vary depending on what the purpose of the exercise is.

Among the numerous tools that might be used in a foresighting session are:

- Analysis and exploration of trends, projections and drivers of change;
- Generating contrasting narratives about the future to stimulate creative thinking about possible, alternative patterns of city development and change;
- 'Wind Tunnelling', in which policy interventions are tested under different scenarios of external conditions to check how robust and viable they are across a range of future outcomes, to reveal hidden assumptions about the future and enhance the adaptability of policy ideas;
- 'Backcasting', which works backwards from specific goals and explores what actions should be taken to get there.

Foresighting is practiced internationally across the public and private sectors, as well as in academia. For example, the Government of Singapore set up the Centre for Strategic Futures in 2009 as a think tank within government to build foresight capabilities across the public service and to ensure foresight informs policy decisions.

It can test assumptions about a specific policy decision, such as investing in flood defences. Alternatively, Foresighting can also to establish a common understanding of the direction and intensity (and therefore relative importance) of a shared list of long-term, strategic policy challenges. It can also be an approach which a government organisation, agency or unit embeds in day to day working to constantly assess and manage strategic risks and opportunities.

Crucially, Foresighting does not require 'a clean slate' to be undertaken effectively. It can be used at almost any point in the decision-making process to test assumptions, proposals and plans. Along with Integrated Urban Modelling, foresighting cannot currently form part of the evidence base under Green Book principles because it is not a form of Cost Benefit Analysis.

Case Study: Government Office for Science Future of cities Foresight Project[31]

In 2013 the Government Office for Science carried out a major project to explore the key opportunities and challenges for UK cities, to aid better policy making. As part of this, the Office worked with 25 cities and held extensive foresighting exercises.

Through their project, the Government Office for Science found that there are a number of substantial strategic benefits to using foresight studies. They included:

- Exposing local strengths, which can be enhanced through policy making;
- Enhancing resilience, through the identification of risks and challenges;
- Strategy refinement, through increased clarity and alignment of place-specific aspirations, local assets, opportunities, and enhanced awareness of risks;
- Increased investor confidence to invest in a city's future;
- Strategic partnerships, with businesses engaging with cities' policies and participating in greater data sharing;
- The provision of a safe space for engaging with persistent, politically charged challenges;
- Civic engagement, creative engagement with public provides opportunities to demonstrate city leadership qualities and enhancement of civic pride.

There were also direct, concrete benefits to the foresighting exercise at a number of cities where it was carried out. Newcastle's foresight project contributed to securing £40 million of funding from the National Institute for Ageing Science and innovation, while Liverpool's study led to a major housing provider refocusing its spatial strategy towards developing the Manchester corridor.

RECOMMENDATION:

✪ **Use strategic modelling (such as Integrated Urban Modelling and Foresighting) to evaluate options early on, across multiple outcomes**

Chapter 4

The right framework for decision making

Successful infrastructure planning, delivery and maintenance requires a set of structures that ensure the right factors are taken into account during the decision making, construction and operational structures of a project.

To address this, further devolution of power from Westminster is vital. The command and control model overseen by the Treasury has proven itself unable to deliver the infrastructure development that the country needs despite the best efforts of staff across Government.

The most consistent frustration raised by stakeholders at all our roundtables was the fragmentation of infrastructure decision making, delivery and maintenance. On a day-to-day level this was a source of concern, but it also led to more serious concerns being raised about whether we have the right bodies in place to deliver the infrastructure our country needs in the months and years to come.

- **More regional and national level planning is required to create frameworks under which development can be focussed.**
- **Greater freedoms to raise money for investment are needed at local level**

Any piece of physical infrastructure is, by definition, integrated into the complex networks which underpin our economy and society. This can entail some, or all, of the following factors:

- **Geographical interdependence, and interdependence of scale.**
  An inter-city rail line will only be successful if there is the suitable local transport infrastructure around its stations
- **Interaction between different forms of physical infrastructure.**
  Waste management is impossible without road infrastructure
- **Coordination with social infrastructure.**
  Housing and schools only function if they are linked to sewage systems, while sewage systems are useless unless they are connected to the social infrastructure they serve
- **Interaction with the people who use physical infrastructure.**
  Millions of people pass through stations serving our rail networks every day, and their experience is affected by how well designed those stations are. Meanwhile, whether or not our rail networks are accessible to a town, suburb, or village could have significant impact upon the social inclusion of those who live there.

Successful infrastructure planning, delivery and maintenance needs to be able to deal effectively with this complexity.

Different levels of public authority, with the necessary powers, are needed to deal with different spatial scales, with coordination between bodies that work on different scales, and which deal with different types of infrastructure. The proper 'macro' level structures must also in place to ensure that infrastructure is integrated between different spatial scales and to integrate infrastructure strategies with a wider agenda for an area, covering issues such as health and employment.

We have already identified problems associated with 'siloed' approaches to infrastructure decision making. Our proposals for reform would go a significant way towards ensuring infrastructure decision making and delivery is more effective in supporting a wide range of public policy goals.

However, decision making and delivery will remain fragmented unless we reform the structures and powers of the public bodies with responsibility in this area. Too often, we heard, local decision makers feel ill-equipped to meet the scale challenges they face, and find that they are working in tension rather than collaboration with those that should be their partners. Too often, even well-planned schemes fall victim to a lack of financial resources. As the CBI/AECOM Infrastructure survey identified in 2017, the "either/or debate" about regional infrastructure is a cause of immense frustration and must be a priority for reform.[32] This will be hard to deliver unless the Treasury is prepared to give local and regional bodies greater freedom to finance investment – either through taxation or borrowing.

The Government has already made significant progress. Devolution is empowering Combined Authorities to coordinate infrastructure in the service of regional priorities. The National Infrastructure Commission has begun to provide a national vision for how infrastructure can better achieve ambitious goals, such as economic rebalancing and environmental sustainability. The Housing and Infrastructure Fund is providing the kind of planning that local leaders need to unlock sustainable development. But this agenda needs to be pushed even further.

The confusion in spatial planning needs urgent clarification to give certainty to those planning public and private investment

First, there needs to be a straightforward rationalisation of spatial planning for infrastructure. We heard that there is confusion between different levels of spatial planning, and a lack of clarity about how each relates to one another. A single area can have four different infrastructure-related plans relevant to it:

- Combined authority plan;
- Local authority plan;
- Neighbourhood plans;
- Strategic Economic Plans (SEPs) drawn up by LEP.

LEPs themselves are not statutory planning bodies. However, local planning authorities are obliged by the NPPF to 'work collaboratively on strategic planning priorities to enable delivery of sustainable development in consultation with Local Enterprise Partnerships'.[33] And, more significantly, LEPs produce strategic plans which are above the level of planning authorities. They funnel huge levels of resource into infrastructure (sometimes billions of pounds) on the basis of these plans.

Planning at different levels is a necessary part of any well-functioning system. But a problem arises where, as often seems to be the case, there is a lack of coherence between the different plans; and, worse, a lack of clarity over what plan takes precedence over another. We heard, for instance, that different projections for population growth can be used between SEPs, neighbourhood plans and local plans in the same area, creating different assumptions about the future demand for housing and infrastructure.

Work commissioned by the Royal Town Planning Institute (RTPI) has raised more general concerns about the appropriateness of the LEPs' current role in spatially planning for infrastructure.[34] SEPs do not need to (and often will not) consider issues such as deprivation and environmental sustainability when setting out their vision for infrastructure in their area.[35] Many do not make any reference to local plans.[36] While many SEPs are undoubtedly valuable documents, there is clearly a tension between their relatively narrow remit and the more holistic approach needed to meet wider policy goals for a local area.

There needs to be a clearly understandable and expressed overall pattern of planning in England. It needs to be clear how different spatial plans related to each other structurally within the English planning system, and which takes priority.

RECOMMENDATIONS:

- **Require spatial plans to reference all relevant plans in their area**
- **Clarify how Strategic Economic Plans and neighbourhood plans relate to local plans.**

The fragmentation of the decision making and delivery process needs to be addressed

We asked representatives of public infrastructure bodies why they were not collaborating more with other organisations on infrastructure projects. The following were typical of the responses we received:

- That they had found LEPs impossible to work with. This representative told us that they were trying to engage with them on a large infrastructure project, but found that LEPS had short-term horizons;
- That they had given up with working with another body because of huge cultural differences. This representative believed that the other body suffered from institutional inertia. As a result, they had been let down on a number of occasions, and they saw it as more productive to work on their own;
- That local authorities made unreliable partners because changes in political pressures can lead to a rapid change in priorities.

We make no judgement over the extent to which these claims were justified, but they do give a tangible sense of the cultural, incentive and operational cycle barriers to inter-organisational collaboration. These barriers are accentuated by the fact that different bodies can see each other as competitors for resources, rather than partners and that local authorities often consider what infrastructure does for their locality in isolation, rather than a broader region.

Ideally, we should have regional governance structures to set out overarching strategies above the level of the local authority (see Section 3.4). Whether or not this is the case, however, there also needs to be a mechanism in place to prompt different bodies to work more closely together. If there are substantial issues of difference, these need to be worked out, rather than avoided.

The Government recently made a proposal that, in relation to housing policy, local authorities in common market areas should have to produce together a statement of common ground.[37] This is to overcome the problem that the 'duty to cooperate' has failed to ensure that local authorities work together effectively and seek agreement on strategic cross-boundary issues.

It would make sense to extend this logic to planning for infrastructure. A statement of common ground could be produced by all relevant bodies (such as Highways England, Network Rail, local authorities, combined authorities and development corporations) across relevant market areas for infrastructure. This would need to be at a higher level than the Housing Market Area. It could be assisted by a process of foresighting, a tool we outlined in Chapter 2.

RECOMMENDATION:

Public bodies across appropriate market areas should be required to agree a statement of common ground in relation to infrastructure before funding is made available.

Planning authority skills and capacity

Proactive planning, as one part of a wide-ranging, long-term vision for an area, is critical to the successful delivery of infrastructure. As noted previously, physical infrastructure underpins social infrastructure, and what is delivered has significant implications for issues such as sustainability, health and employment.

Local authorities have a pivotal role to play in proactively planning for delivery in their areas, including through the coordination of housing and infrastructure. However, as recent research by Planning Futures has shown:

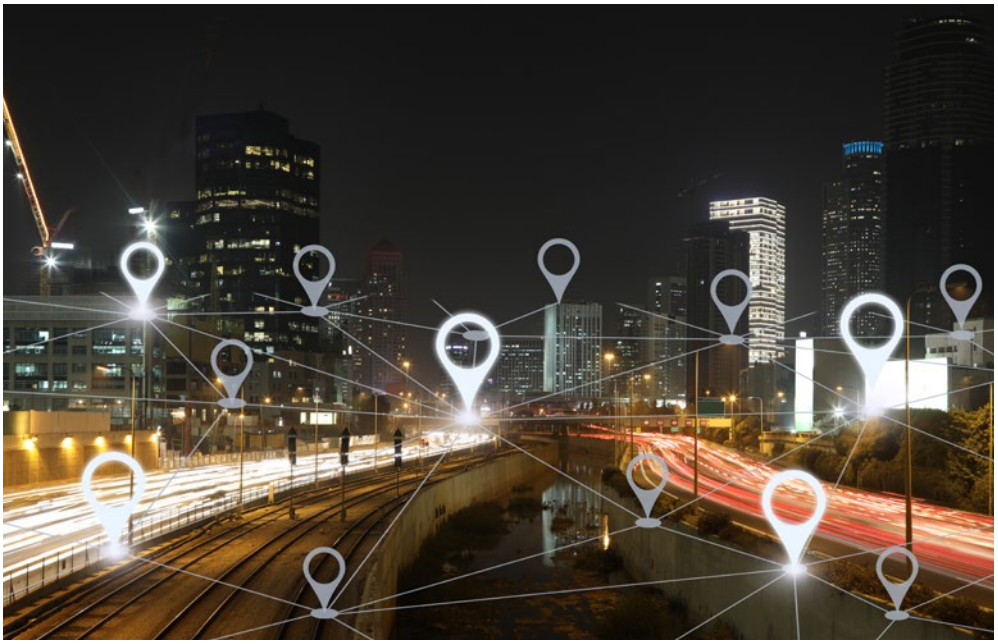
PLANNING DEPARTMENT CUTS

- Between 2006 and 2016 Government cuts have led to a reduction of planning department staff by, on average 15%. In the North West, planning departments have shrunk by 30%;[38]
- It is now challenging to attract quality planners, and graduate and student planners have been used to plug gaps in the services;[39]
- And, as consequence, 'most [local planning authorities] have pursued a strategy of prioritising their statutory duties "at the expense of everything else". This has ultimately lead to a planning service within many Local Authorities that is more reactive and less proactive.'[40]

We will not achieve a proactive approach to planning for infrastructure unless local authorities have the resources, skills and capacity they need.

RECOMMENDATIONS:

- **Local authority planning departments should have funding ring-fenced**
- **Initiatives to boost the planning profession should be supported such as the recently-launched Public Practice, a scheme for planners along the lines of Teach First and Frontline.**



Housing and Infrastructure should be coordinated more proactively to increase the availability of viable land ready for development

A coordinated, proactive approach to infrastructure and housing is especially important. This goes beyond the common sense point that infrastructure provides the underpinning for housing development (and therefore unlocks sites for housing).

Infrastructure provision leads to land value uplift.[41] This is potentially advantageous: it can encourage developers to invest and accelerate delivery on sites (which may already have planning permission).[42] And if this land value uplift can be captured by a public body, it can be used to deliver social goods (including further physical and social infrastructure provision).[43]

TFL PROJECTS £36 BILLION

LAND VALUE UPLIFT £63 BILLION

But this land value capture can only happen if housing and infrastructure are coordinated, or if a pubic body has the power to capture land value uplift. Frequently, new infrastructure is provided without such mechanisms in place. Increases in land value are lost to private interests. To give a sense of the scale of the issue, KPMG and Savills have calculated that eight prospective TfL projects (including Crossrail 2, the Bakerloo line extension and the DLR extension to Thamesmead) cost around £36 billion, but could produce land value uplifts of £63 billion on existing stock, and £24 billion on new development.[44]

The problem is particularly immediate in the delivery of new sites.[A]

A It is possible to capture land value uplift on land with existing stock through Land Value Taxation. However, this entails overcoming a range of substantial practical hurdles that it is beyond the remit of this report to consider. For more, see Collins, Lloyd and Macfarlane, *Rethinking the economics of land and housing*, pp199-205.

Case Study: Ebbsfleet Garden City

Despite often being conflated in political and policy circles, there are fundamental differences between Ebbsfleet Garden City and its twentieth century New Town and Garden Town predecessors. Rather than starting with a new, greenfield site from scratch, and driving the overall project forward as the single overarching planning and development vehicle from the beginning, the Ebbsfleet Development Corporation (EDC) was instituted to unlock stalled private development from housebuilders which had already been granted planning permission on their sites.

There is no doubt that this intervention was sorely needed. The Ebbsfleet area had major planning permissions dating back as far as 2002. In theory, the site is ideal, because it has a station on the HS1 line, only 20 minutes from London. But by February of 2016, just 383 homes had been completed.[45]

There are several key infrastructure-related challenges that the EDC has already helped to resolve:

- The area required roughly £30 million worth of improvements to electricity infrastructure for significant housebuilding to go ahead. However, whichever developer took forward their scheme first would be the one that bore the cost; the result was inertia. The EDC will therefore now fund electricity infrastructure upfront, and recoup some of these costs from developers when they require it;
- The EDC has been working with Thames Water and Southern Water to, jointly, create plan to provide water infrastructure;
- Highways England recognised the need for improvements to Bluewater and Ebbsfleet junctions, and had slated improvements to be funded by developer S106 money. But the developers were unable to bring forward their schemes without the improvements to the junctions. To overcome this 'catch 22', the EDC will fund the improvements upfront and later recoup the money from the developers;
- The developers are planning to provide 70% of the planning and cycling infrastructure, but this had left 30% without a funding or delivery plan. This will now be provided with the EDC, alongside a bridge linking the station to a key housing site;
- To provide further local connectivity, which is necessary if the roads are not to become congested, the Development Corporation will set up a bus company. The plan is to eventually recoup the funding through bus fares;
- The EDC has catalysed cross-organisational collaboration between the infrastructure providers and developers by convening regular meetings between the relevant stakeholders to build a common vision and overcome difficulties.

As a consequence, after years of delay, hundreds of homes are now being delivered each year. It is worth noting that substantial public funding has been required to unlock this private development and that this support has still not been sufficient to provide adequate levels of social housing, or housing for older people at this stage.

The example of Ebbsfleet is instructive for two reasons. First, it shows just how important the coordination of housing and infrastructure is to get housebuilding moving. With development fragmented across many organisations, it proved impossible to deliver for the site without the EDC to catalyse activity even with £310 million of Government funding. And this is on one of the most favourable sites for development in the country with the HS1 link to London.

Case study: Kirkstall Forge & Apperley Bridge

Kirkstall Forge & Apperley Bridge stations in West Yorkshire are good examples of the barriers which are erected by our current system.

When the first trains called at Apperley Bridge Station in December 2015 Kirkstall Forge Station in June 2016, it was over 15 years since the two stations – which sit on existing commuter trains routes into Leeds and Bradford – had been identified as priorities for investment. Despite, the fact that the cost of building a new station at Kirkstall Forge was less than £20 million – of which nearly £5 million was to come from the commercial developers of the site – central permission and funding was required by law for the scheme. These complex rules meant that it was not until 2011 that a request to the Department of Transport was made. It then took nearly three years to secure funding.

Kirkstall Forge in particular represents a text-book case study of national decision making holding back local economic development despite the amounts of money involved being insignificant by national standards.

A complex brownfield site which sits on the River Aire and a main commuter road and rail link into Leeds, the opening of the station is the first element of a £400 million regeneration scheme which will see over 1,000 new homes and 400,000 sq ft of commercial, retail, leisure and a primary school built in a location which is less than ten minutes from Leeds by train.

£400 MILLION REGENERATION SCHEME

The experiences at Ebbsfleet and in West Yorkshire show the extreme difficulty in delivering new towns without the kind of model that was followed by the New Towns and Garden Cities of the 20th century. If this model were to be deemed politically attractive, the Garden City model could be reborn for the 21st Century albeit with a greater role for the private sector. A local authority or development corporation could act as master-developer, obtain outline planning approval (based on local consultation), put in basic infrastructure and sell serviced plots to builders. It would require a clear planning brief, including the approved masterplan and a design code that covers scale and density, housing type and tenure, space standards, parking, open space including play, non-residential facilities and so forth. The local authority or development corporation would set out the programme and manage the process from start to finish, potentially making the detailed approval process quite straightforward.

Crucially, this model could allow for the capture of land value uplift, which can then be used to fund infrastructure and affordable housing, and raise the quality of design. The main reason holding back this approach is that, when local authorities and development corporations come to purchase land, its value rockets in anticipation of a change of land use.

RECOMMENDATION:

CPO compensation should be set at existing use value, with an additional premium provided to compensate land owners.

To take this proactive approach also requires finance. The Government should be commended for its introduction of the £5 billion Housing Infrastructure Fund, which was doubled at the 2017 Autumn budget from £2.3 billion.[46] It offers funding to local authorities on a competitive basis and is designed to deliver infrastructure which will support hundreds of thousands of new homes. This is exactly the approach that is needed: substantial investment in infrastructure to support broad, strategic goals.

RECOMMENDATION:

The Housing Infrastructure Fund should be expanded.

We would also like to see the Government extend the logic behind the infrastructure investment fund to locally generated local authority funding. This would require the removal of the regulations that currently prevent the pooling of budgets to deliver schemes in a coordinated and comprehensive manner. Revenue streams such as S106 and CIL money, Right to Buy receipts, and new homes bonus payments could help boost local investment capacity.

RECOMMENDATION:

Local authorities should be permitted to pool and co-ordinate of locally generated housing and infrastructure funding streams.

Finally, it is important to emphasise that adequate infrastructure housing is not simply a matter of transport connections. Having access to enough nursery school places, employment opportunities, health and day care centres, leisure facilities, open space is vital for personal wellbeing, mixed communities and local acceptance of new development. The higher the density, the greater the demand on local services.

Further powers should be devolved to Combined Authorities to allow for greater coordination of public policy aims

Even with properly resourced, fully functional, local planning departments, there would still be structural deficiencies in the UK's infrastructure delivery. This is because local authorities are simply too local to adequately plan for certain physical infrastructure, and are too small to provide the impetus for large infrastructure projects to get off the ground.

Regional economies function on a wider scale than is reflected by local authority boundaries. These so-called Functional Economic Market Areas (FEMAs) are defined by a range of factors, such as travel to work areas, consumer market areas, and infrastructure networks.[47] This was recently recognised as the Government: in 2014, the Planning Practice Guidance was updated to state that economic development needs should be assessed in relation to relevant FEMAs.[48]

However, in the UK, there are often no public bodies reflecting the geographical location of FEMAs.[B] This is worrying, because international evidence suggests that devolved government at the level of the FEMA is critical to economic success.[49] The introduction of combined authorities through devolution deals is beginning to change this picture. They work at the level of the FEMA, and therefore can potentially take control over the whole of local transport networks. And, what is more, they can use those powers to support wide-ranging visions for their areas.

We have already seen the success of this approach under the GLA in London. With TfL, the Mayor has oversight of swathes of public transport, and is able to deliver rationalisation of prices and service delivery across the capital. He can use transport policy to support a range of goals and initiatives, from extending rail networks to stimulating regeneration and housing growth, to improving public health through schemes like the congestion charge and cycle hire. The GLA can command the confidence of both Government and the private sector to successfully lobby for, and deliver, huge infrastructure schemes like Crossrail.

Regional public authorities can even use revenue raising and borrowing powers to part- fund such schemes themselves. Local authorities struggle to self-fund large infrastructure projects, one way or another. This point has been borne out by the difficulties they experienced in trying to implement the Community Infrastructure Levy (CIL).[50] The purpose of the levy was that, by imposing a flat-rate charge upon developers building in their areas, local authorities could accumulate the capital to self-fund important infrastructure themselves. But, often, local authorities found themselves in 'catch 22' situations: unable to fund infrastructure necessary to unlock development without CIL money, but unable to gain sufficient CIL money to fund this infrastructure without largescale development. As a consequence, the role of CIL became blurred with S106.

B They may (or may not) de facto be covered by LEPs, but as we outline is Section 3.1.2, the role of LEPs in spatial planning is not without its problems.

Contrast this to the success of London Mayoral CIL, which was used to part-fund Crossrail. A Government-commissioned study shows that:

> *London Mayoral CIL provides an interesting example of how a relatively low level and simple levy applied across a wider economic area has been able to provide a contribution towards the funding for one large identified piece of infrastructure. It could well be argued that this is closer to how CIL was meant to operate in its simplicity, universal applicability and use than most of the CILs that have been introduced elsewhere.* [51]

The GLA has also managed to leverage substantial borrowing against future revenues to fund infrastructure provision. This includes a £1 billion loan for the Northern Line extension, which will be repaid, in part, through the growth in business rates which is expected as a consequence of the new line (known as tax increment financing).[52] Even if the Treasury were minded to permit it on a broad scale, it is hard to imagine most local authorities having the ability to borrow such sums, even with business rates localised.

RECOMMENDATIONS:

- **Strike new devolution deals until there is a solution in place for every area of the country**
- **Create a pathway to deepening devolution deals to ensure powers can be at least as extensive as those held by the Greater London Authority.**

A National Spatial Strategy should be developed to coordinate development and facilitate inter-regional cooperation

Some decisions about infrastructure can only be effectively made at the national level. The last Government took an enormous stride in this direction by setting up the National Infrastructure Commission. Through its National Infrastructure Assessment, the Commission has begun to provide the long-term thinking that is desperately needed.

But a national spatial strategy is needed to complement the Commission's work. By thinking spatially at the national scale, the Government could plan *where* improvements are needed to our rail networks, aviation capacity, port capacity, flood defences and other elements of infrastructure needed to deliver its national vision for economic development and social prosperity. The benefits of this approach become clear if we examine the shortcomings of two current areas of Government policy focus.

The Government accepts that new settlements will be necessary if we are to match the post-war housing boom and solve the housing crisis. Indeed, it has a programme of funding to support a new generation of 'locally-led' Garden Cities, Towns and Villages.[53]

However, these proposed new towns pale in comparison to the scale of those built in the twentieth century. The maximum size of new Garden Cities, Towns and Villages is proposed to be 10,000. Past new towns have been planned to accommodate many tens of thousands of people; Milton Keynes' population is now 229,941. This required spatial thinking about where to place these substantial new settlements, how to support them with infrastructure, and where to locate industry. We simply do not have the planning mechanisms in England today which could accommodate such decision making.

A second area where this spatial approach is sorely missed is the Industrial Strategy.[54] While the strategy states that the Government recognises the importance of 'place', it contains surprisingly few references to *actual places*. True, there is new funding which devolved Government can bid for. But there is no overall strategy for where this funding needs to go across the country. There is no identification of interventions that might require coordination at a level above existing public authorities. And there is scant recognition that successful regional strategies will require an active coordination of various approaches (such as skills and infrastructure delivery) simultaneously.

What is needed is a spatial strategy that works with local and regional stakeholders to identify, broadly, where there is the potential to build upon regional strengths through infrastructure investment (and other public policy).

Once corridors and regional opportunities areas have been identified, this could be the basis to spark critical governance reforms at the regional level. This potential is demonstrated by the one-off study carried out by the National Infrastructure Commission on the Cambridge – Milton Keynes – Oxford corridor.

Case Study: Transport for the North[55]

Transport for the North is a body set up to develop a strategic plan for the north. Their Board is made up of elected and LEP representatives from all areas of the North, along with the Secretary of State for Transport and representatives from Highways England, Network Rail and HS2.

It is developing a multi-modal, long term Strategic Transport Plan for the North of England. Their ambition is to connect the key economic areas of the North to drive growth, improve access to jobs and ensure the North is a great place to invest and live.

As a key part of this, they have identified a number of spatial corridors where, there is the potential to building upon existing economic networks and regional strengths for substantial productivity gains and business growth.

For example, the "Connecting the Energy Coasts" corridor (see above) is based around the advanced manufacturing businesses and energy generation facilities located in the North East, Tees Valley, Lancashire and Cumbria; and the need to provide transport connections to unlock employment, supply chain and housing opportunities.

Case Study: The National Infrastructure Common Cambridge – Milton Keynes – Oxford Arc[56]

The National Infrastructure Commission was commissioned by the Government to set out proposals and options to maximise the potential of the Cambridge-Milton Keynes-Oxford Arc.

The Commission engaged with a range of stakeholders from across the arc including local authorities, Local Enterprise Partnerships (LEPs), universities, and Government departments to develop their proposals. These included recommendations for strategic transport investment, and mechanisms to double the number of homes built. This, in turn, needs to be underpinned by a clear spatial vision. And this requires governance reform:

> *Developing a fit-for-purpose vision and supporting plans will require local authorities and LEPs to work across administrative boundaries and to deepen existing collaborations. It will require them to put in place new governance structures to enable collective decision-making and signal their long-term commitment to the success of the arc.*[57]

Ultimately, the Commission says these new governance structures could evolve into statutory combined authorities.

RECOMMENDATION:

✪ **Develop a National Spatial Strategy to create a framework which aligns infrastructure and economic development with housing growth.**

Chapter 5

Good design in infrastructure

Whether by design or as a side effect of their construction, infrastructure schemes alter how we live our lives. The visible impact of many infrastructure projects means that their appearance can play a major role in governing public perceptions. To ensure that proposals win public support and then maximise the positive impacts, time and investment needs to be devoted to good design.

The infrastructure that we build today will shape our built environment for decades, even centuries to come. In England, we still benefit from the railways, bridges and sewers built by our Victorian predecessors. They sought to tackle immediate problems: growing sewage waste in big cities, difficulty of shipping goods from industrial towns to the ports, the crime which flourished on dark streets at night. But their forethought in creating well designed infrastructure has meant their value has endured well beyond their foreseeable lifespans, and their initial purposes. If we are going to create infrastructure with the same lasting value, then we need to deliver on quality of design.

- **Deciding how best to promote good design is an essential part of the planning stages of an infrastructure project. Success or failure of a project can often depend on initial perceptions, so the failure to consider design issues early in the process can lead to significant delays or even cancellations later on.**
- **Good design is also the key to developing projects that can adapt to changing social and environmental priorities quickly and easily.**
- **Embedding design quality in a project early on helps to create greater consistency and increases usability.**
- **Design quality can be safeguarded in through engaging other stakeholders, including the public.**
- **Large infrastructure projects offer an opportunity to deliver quality infrastructure, and raise aspirations for the built environment.**

The importance of Design Quality

Good design is not just about the striking architecture we associate with big, iconic structures, such as the Millennium Bridge or Birmingham New Street Station. It is also about the functionality of places, the durability of built forms, flexibility of function, and value for money.

> *Infrastructure needs to be designed and built well. This does not mean over specification or gold-plating. High quality infrastructure need not be lavish or cost more. But it does mean ensuring that projects are adaptable to different visions of the future, that they meet the needs of those who will use them, and that the quality of their design has been considered from the beginning. This is in part about appearance, but it is also about how infrastructure performs over the long term, what it is like to use and how it fits within its environment.*
> National Infrastructure Commission

> *We recognise that good design saves resources. Indeed, bad design is a long-term cost to bear for the taxpayer and for our future customers.*
> High Speed Two

As we have argued throughout this report, high quality physical infrastructure underpins the success and prosperity of society. Better design means better results and, crucially, attention to design can unlock community benefits which had not been envisioned at the start.

Flood defences are often considered an eyesore, which jar with the built environment of the locality but as RIBA's research on flood-resilient architecture has shown, this need not be case. A design-led approach can ensure flood defences complement the assets of a locality and build in multifunctionality, generating financial, social and environmental benefits in addition to reducing flood risk. In turn, this can help to attract private investors to co-fund the schemes, reducing the burden on the tax payer.

Good infrastructure design can be unobtrusive but that does not mean that its aesthetics are unimportant. As well as striking built forms, it is the 'beautiful ordinary' which does so much to enhance the quality of our lives.

This is well demonstrated by the strengths of the integrated approach to design which characterises much of the London Tube Network. TfL have recently developed a 'design idiom', to better understand their historic assets, and to provide a basis for future work.

Case study: Multi-functional Flood Defence in Katwijk aan Zee, Netherlands

A multifunctional design had been used to upgrade Katwijk aan Zee's existing dike in response to increased development and rising sea levels. The new structure, consisting of a storm-proof wall concealed underneath an expanded strip of sand dunes, helped to preserve the village's character in addition to providing added flood protection.

The new dike design also enabled the safe integration of an underground parking lot on the land side of it, and a few restaurants on the other, all covered by the same sand giving the impression of seamless integration. This helped to tackle the village's growing parking problems which were obstructing sea views, and provided attractive new recreational facilities for walkers.

Katwijk aan Zee dike redesign by Arcadis Netherlands, Royal HaskoningDHV, OKRA Landschaparchitecten, and WB de Ruimte (Photo: Arcadis)

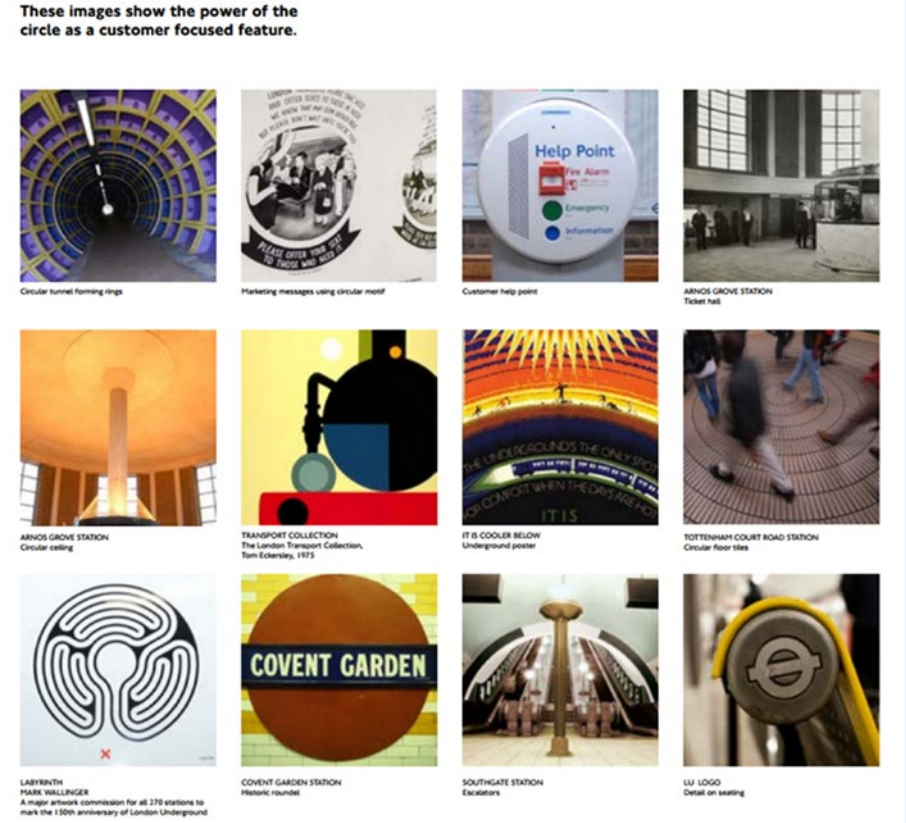
Case Study: The London Underground Design Idiom[58]

Noting that some improvement works in recent decades have been substandard in terms of design, TfL have committed to creating spaces which are of the highest quality.

> *Good design should be the driver of decision-making, should permeate every level of the organisation, and should, ultimately, be celebrated by everyone. It doesn't have to cost more; it's an approach and an attitude of mind that thinks both broadly and carefully about what we do.*

So, what exactly do TfL mean by 'good design'? For them, it means the creation of places which cohere, and which are 'legible' to those using them; and which also are aesthetically pleasing to those taking their daily commute. As they put it: 'we want more 'moments for the soul"; for every station to be remarkable in its own right, while still feeling like part of a whole'.

This means paying close attention to the details. The cluttering of spaces should be kept to a minimum. Lighting should aid orientation and make people feel safe, while providing emphasis upon the memorable features of each station. Symbols built into the architecture of stations, and more transient forms of design, should be considered in terms of impact upon overall user experience.



For TfL, there are concrete benefits to taking this approach. Their research has found that:

- There is a significant relationship between high performing built environments and customer satisfaction and reputation
- Functional issues, such as decluttering, strongly drive customer satisfaction
- Emotional factors, such as lighting and reflecting local character, strongly drive reputation
- Further improvements to customer satisfaction and reputation depend on enhancing the quality of the customer experience, which positively influences things like the perception of journey time.

As TfL's approach indicates, it is in the best interests of both private and public sector bodies to invest in the design of their infrastructure. Reduced maintenance costs and improved customer experience affect the bottom line. And, where schemes are controversial, it is good design which can win the support of the wider community.

Architects add value to the decision-making process through their ability to integrate a range of factors into a final proposal

We are beginning to see greater recognition of the unique role architects can play in physical infrastructure design and delivery. In the UK, architects generally have less involvement in the design of infrastructure than on the Continent. But architects bring a unique skill set, which can complement those of their co-professionals.

> *Good design requires good designers … A small minority of civil engineers become bridge designers, and their academic training generally deals with appearance within the process of bridge design at a very elementary level. Architects learn through integrated design with particular emphasis on appearance all through their training and in practice are constantly aware of the aesthetic implications of their decisions. Therefore they can make a valuable contribution to bridge design, especially on sensitive sites and on major structures.* [59]
> Highways England

In our roundtables clients who employ architects described the value they place on the holistic nature an architect's approach. By 'thinking outside the box' and looking beyond immediate challenges to consider how broader goals might be achieved, the early involvement of architects was seen as key to a successful outcome. Clients also referenced architects as good communicators, able to turn an idea into a reality and then communicate this to other parts of the project team.

Case Study: Ely Southern Bypass

Bypasses are often contentious proposals. The unsympathetic design for a bypass affecting countryside views of Ely Cathedral attracted widespread opposition from local and national stakeholders, including English Heritage. Failure to address concerns about the design risked project delay or cancellation because of the fixed windows for funding availability. Indeed, a 'holding direction' from the National Planning Casework Unit on behalf of the Secretary of State highlighted the complexity of the approvals process and the possibility of a public inquiry.

Knight Architects were brought in to completely review all structures on the route. They used their skill and experience to work out a way of overcoming previous poor design and address spoilt views.

The idea was to strategically refocus the project so that it delivered a new benefit for the local community and the public realm setting of this important new infrastructure. The architects designed a pedestrian walkway to link across the river, a 'Circular Way' which offers people the chance to follow the Great River Ouse out of Ely before returning along the opposite bank.

By creating a flowing form involving natural materials, they drew attention away from the more utilitarian road transport element of the bridge from the city side and focused it on the elegant, softer feel of the walkway. Adding a viewing platform reinstates that all-important view towards the historic cathedral.

To ensure that their scheme address the concerns, and reflected the aspirations of the local community, the architects working on the project led public presentations and workshops, aided by high-quality visualisations and interactive computer models, which allowed people to engage positively with the process and provide feedback on design.

As a result, the bridge was enhanced from a piece of regional infrastructure to a more elegant crossing with local community value, and won the support of English Heritage and local stakeholders. On review, in September 2014, Secretary of State Eric Pickles lifted the holding direction and allowed the planning approval for the scheme to stand and funding for the scheme was granted by the Department for Transport.

Case study: Millau Viaduct

Bridges are often considered to belong to the realm of the engineer rather than that of the architect. But the architecture of infrastructure has a powerful impact on the environment and the Millau Viaduct, designed in close collaboration with structural engineers, illustrates how the architect can play an integral role in the design of bridges.

Located in southern France, the 2.46km long bridge carries the A75 autoroute from Clermont-Ferrand to Béziers across the Massif Central. The A75 now provides a direct, high-speed route from Paris to the Mediterranean coast and on to Barcelona. The bridge crosses the River Tarn, which runs through a spectacular gorge between two high plateaux.

© Jean-Philippe Arles, Reuters Corbis

A cable-stayed, masted structure, the bridge is delicate, transparent, and has the optimum span between columns. Its construction broke several records: it has the highest pylons in the world, the highest road bridge deck in Europe, and it superceded the Eiffel Tower as the tallest structure in France. Each of its sections spans 342 metres and its piers range in height from 75 metres to 245 metres, with the masts rising a further 87 metres above the road deck. To accommodate the expansion and contraction of the concrete deck, each column splits into two thinner, more flexible columns below the roadway, forming an A-frame above deck level. The tapered form of the columns both expresses their structural loads and minimises their profile in elevation. Not only does this give the bridge a dramatic silhouette, but crucially, it also makes the minimum intervention in the landscape.

It is hard to assess the overall design quality of the infrastructure which we are building across the country. Unlike the design quality of housing, on which we have seen regular studies and assessments, and which has been the topic of Parliamentary debate and scrutiny, the design of infrastructure has often been off the radar.

The design quality of infrastructure schemes varies across the country. At our roundtables, a poor quality built environment was seen to breed expectations for poor quality in new development among planners, developers, and the public. It was noted that this has wider impacts for economic development, as businesses avoid relocating to areas where they believe their employees will not have a good quality of life.

It is also clear that we are often failing to take the holistic, design-led approach to infrastructure that can unlock unforeseen benefits. The kind of multifaceted, holistic approach that is exemplified by the flood defence in Katwijk aan Zee, described above, is rare in the UK. There are therefore likely to be a large number of 'unknown unknowns', of benefits that we are not even aware we are missing out from because of our approach to infrastructure in the UK.

Design quality needs to be embedded into the infrastructure decision making process

Design quality is not currently systematically embedded into processes for the planning and delivery of infrastructure. Architects we spoke to talked of their experience of being brought in late in the process, essentially for damage limitation where a project had become a source of public controversy. This is problematic: if they were brought in earlier, they felt they might have been able to overcome design issues 'locked in' by a later stage.

We also heard that, too often, when design issues are considered early in the process, this may not follow through into what is actually delivered. Designs approved when a scheme is granted planning permission are often substantially cost engineered at a later stage. This issue is common across procurement of all types and the potentially serious consequences of lack of continuity in the development and 'ownership' of design is increasingly widely recognised.

This need not be the case. For example, the Mersey Gateway Crossings Board went beyond normal processes to issue a detailed design guide in the form of a Design and Access Statement for their proposed bridge. In addition, a contractual obligation was made to satisfy planning conditions and the planning authority was supported by an experienced consultant team advising them on behalf of the client. It is not necessary to prepare a fully developed design early on, but quality must not be used as a mechanism to pass the test of planning, only to be dropped afterwards.

There are a range of procedures and standards that need to be followed for a new infrastructure projects, which must be signed off by the relevant local planning and technical authorities. In contract, design quality issues are much more discretionary. For instance, Highways England has issued a guide on design quality issues (BA 41/98) in their highly detailed and prescriptive Design Manual for Roads and Bridges; but, unlike much of the document, it is purely 'advisory'.[60] Embedding compulsory requirements to meet standards of design quality, and requiring them to be met in applications for approval, would encourage serious thinking early about the design quality of what is being built, and hold private and public sector bodies to account for following through on their commitments. Good practice in design quality should not be seen as a discretionary part of an otherwise compulsory set of standards, where departures from standards suffer serious scrutiny.

RECOMMENDATION:

Include compulsory requirements for design quality in technical documents, such as the Design Manual for Roads and Bridges.

Design quality can also be improved and safeguarded by using Design Review Panels, typically composed of architects, urban designers, urban and rural planners, landscape architects, engineers and other specialist experts. Design Panels now advise on the work of both HS2 and Highways England[61] and this approach should be extended, bringing valuable expertise to the decision making of local planning departments, which may have little experience of large and complex infrastructure schemes.

THE ROLE OF LARGE INFRASTRUCTURE SCHEMES

At the other end of the scale are the very large infrastructure schemes which will affect large numbers of people. This should be an opportunity to not only deliver quality infrastructure, but to raise aspirations for the built environment. This will only work if there is a unified vision to drive consistently high quality across the board.

Case Study: HS2 Design Vision

HS2 have set out a design vision, to deliver social and economic benefits as part of the scheme through quality design. There are nine different aspects to the vision:

1. **Design for the needs of our diverse audiences**
2. **Engage with communities over the life of the project**
3. **Inspire excellence through creative talent**
4. **Design places and spaces that support quality of life**
5. **Celebrate the local within a coherent national narrative**
6. **Demonstrate commitment to the natural world**
7. **Design to adapt for future generations**
8. **Place a premium on the personal time of customers**
9. **Make the most of the time to design**

The Government has set up a Design Panel to provide independent advice and critique the development of HS2, to help achieve its Design Vision.

RECOMMENDATION:

✪ **Public bodies delivering large infrastructure projects should set out ambitious design visions, which apply across the sites in which they are involved with.**

THE ROLE OF THE NATIONAL INFRASTRUCTURE COMMISSION

The National Infrastructure Commission has had an important role to play in bringing greater long-term, thinking about infrastructure planning and delivery into play in the UK. It has also increasingly been an advocate of design issues.

But it could take on a greater role in the future. The NIC has already stated its intention to set up a national design panel, to consider infrastructure design issues of national importance. It could also provide leadership on data collection, and help create a greater understanding of good practice in the UK. This is particularly important in the current absence of any central government body with a remit for bringing together knowledge, and providing strategy, in this area.

RECOMMENDATION:

✪ **The National Infrastructure Commission should establish a national design panel and build an evidence base of 'what works'.**

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