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City-Regions shaping transitions in critical infrastructures: challenges, responses, limits, opportunities and key lessons and achieving “fit”

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City-Regions Shaping Transitions in Critical Infrastructures:

**Challenges, Responses, Limits/Opportunities and
Key Lessons in Organising and Achieving “Fit”**

Synthesis Report of Phase 2

**Report for Northern Way Sustainable
Communities Team**



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1. Introduction

In May 2007 SURF was commissioned by the Northern Way to examine the relevant and transferable lessons of different city-regional infrastructure management frameworks. This built upon an earlier project that identified significant disconnections between city-regional territorial priorities and the planning of infrastructure networks – water, waste, flooding, energy and transport. The purpose of the new research is threefold:

1. A number of English city-regions are currently scoping the roles and responsibilities of the Executive Board model for city-regional governance. Critical infrastructures are a key issue for these city-regions, but frameworks for effectively shaping infrastructure networks according to local priorities, are underdeveloped in the English context.
2. Devolution frameworks in Scotland (Edinburgh/Glasgow), Wales (Cardiff) and London have created new “city-regional” governance structures (formal and informal) that has established policy frameworks (non-statutory and statutory) for shaping critical infrastructure networks. Consequently there is an opportunity to strategically assess how existing models and practical experiences may inform developments in England outside of London.
3. The key aim of the work is to therefore critically review the relevance and potential transferability of models developed elsewhere in the UK and the lessons they have for shaping critical infrastructures through the Executive Board model of city-regional frameworks in Northern England.

In particular, the organisation of growth activities (economic development, increasing population, additional housing) raises serious challenges about how the critical infrastructures that are needed to support such growth is provided and re-organised at a regional and city-regional scale. In short, the key questions are to what extent is there a “fit” between city-regional growth priorities and infrastructural provision? How is this fit organised in different city-regional contexts within the UK? And what lessons from these examples are pertinent to the Northern English city-regions? This paper addresses these through:

1. Exploring London, Manchester, Cardiff and Glasgow city-regional contexts to understand the design and development of infrastructure policy and governance frameworks in Northern English city-regions.
2. Outlining five strategic responses for addressing city-regional infrastructure provision.
3. And identifying the relevant and transferable lessons from the different combinations – or “picking and mixing” - of these strategies in the contexts of London, Manchester Cardiff and Glasgow.

2. City-Regions and Critical Infrastructures: Four Cases

The purpose of these short case studies is to present a view of how four UK city-regions attempt to develop a “fix” between their own territorial visions (for economy, society and environment) and their infrastructural requirements. All city-regions are grappling with new city-regional visions for their economies with infrastructural endowments that are configured for old economies. This raises a series of questions that structures the case studies:

1. What *challenges* are city-regions setting themselves in their attempts to provide a “fix” between infrastructure and ambitions?
2. What type of strategic *responses* are city-regions developing for their infrastructure and how systemic are their views of the changes in infrastructure required?
3. What are the *limitations, opportunities* and *lessons* of these case studies in terms of the capacity and capability to effect change?

Case 1: Preparing London for Growth - Systemic Transitions in the National Exemplar

The Challenge – Preparing infrastructure for sustainable growth

The mayor and the Greater London Authority (GLA) have a clearly articulated strategy characterised by three key features:

1. Preparing London’s infrastructure for major economic, population and housing growth in a style of development that enables London to become the national and international exemplar of a sustainable city.
2. In order to fit in growth of 800,000 jobs and 400,000 homes by 2016 - equivalent to a city the size of Leeds - a complete suite of strategies are designed to (attempt to) guarantee the infrastructural underpinnings for this growth while reducing resource use and carbon emissions.
3. Central to this approach is seeing climate change as an opportunity for developing a new logic of (global) city-regional infrastructure and growth that is an “exemplary” model for others to follow.

Responses – Developing systemic transitions in London’s infrastructure

The mayor and GLA have used their powers, their own strategies (formal and informal), the London spatial plan, directly funded agencies and specialist intermediaries, to develop the most systemic, comprehensive and long-term response to the infrastructure challenges of supporting high levels of growth in period of resource constraint and climate change of any city-region. Taken together the five strategic logics of London’s’ response (see Table 1) constitutes what can be termed a “new paradigm of city-regional infrastructural development” whose implications are poorly understood.

Table 1: London’s Five Strategic Responses

STRATEGY	KEY COMPONENTS
<p><i>1. Prioritising the (long term) protection of London’s infrastructure as a (shared) national responsibility.</i></p>	<ul style="list-style-type: none"> • Short-term the GLA is currently implementing, (along with other city-regions) PPS25 on flooding - there is concern that post-2030 existing flood defences will no longer be able to protect London from climate change induced flooding. • National government has been positioned to take lead responsibility for a study of flood protection options 2030 - 2100. • The mayor and GLA are seeking a central government commitment to fund as a national priority the investment (£4bn estimated by the mayor) required to protect London.
<p><i>2. Decoupling London’s metabolism from national and regional infrastructures to increase self-reliance.</i></p>	<ul style="list-style-type: none"> • A suite of infrastructure strategies for energy, waste and water are explicitly designed to: <ul style="list-style-type: none"> - minimise the consumption of resources and production of wastes; - to consider reuse, develop decentralised energy production and waste treatment technologies; - and reduce reliance on external infrastructure to increase the relative self-sufficiency of London. • Consequently in 2025 the GLA aims to: <ul style="list-style-type: none"> - treat over 85% waste in London reducing reliance on landfill from 75% to 11%; - increase energy production to meet 60% of electricity and over 40% of heat demands within London; - substantially reduce inefficient water networks, prioritising the efficiency of networks, reduced leakage, conservation methods and prioritising water reuse in new development prior to considering new supply options.
<p><i>3. Reconfiguring of intra-city-regional transport infrastructure</i></p>	<ul style="list-style-type: none"> • Through the congestion charge and proposed emission zone, encouraging modal shift from private to public transport. • Reinvesting in existing public transport networks and building new strategic infrastructures. • Investment in new transport infrastructures, estimated to cost between £10.5 and £17.5bn.
<p><i>4. Prioritising inter-global city transportation infrastructures</i></p>	<ul style="list-style-type: none"> • Despite having few direct powers the mayor is working to improve London’s international connections by shaping the investment priorities of other agencies and ensuring intra-city-regional connections with international airport hubs.
<p><i>5. Using climate change as an (additional) strategy to reinforce London’s global pre-eminence.</i></p>	<ul style="list-style-type: none"> • Establishing the London Climate Change Agency (LCCA) in partnership with EDF to use three sets of London’s resources to position London as the world’s leading and emblematic city in actively embracing and responding to the Stern agenda on climate change. carbon trading expertise in the City, the city’s energy and infrastructural strategies and the wider local expertise and knowledge • London is also working with other global cities and with corporate interests to establish this as the dominant response to roll-out as the infrastructure model.

Limitations, Opportunities and Lessons

The three key limitations of the London approach are:

1. Much of London's response is at the level of aspiration, needs considerable work to translate into practice and, consequently, success is not guaranteed.
2. The strategy of reducing reliance on national and regional infrastructure raises wider questions about the degree to which London is seeking to become more self-reliant rather than participate in the development of more collective and inclusive responses.
3. There are questions about the fit between this new infrastructural logic, exemplified by London, and its potential relevance elsewhere, especially in those cities that do not have such a strong city-regional governance framework.

The three key opportunities of the London approach are:

1. It offers the most systemic attempt to think through the transitions required in infrastructure to meet the growth ambitions of a city-region whilst also directly addressing and internalising questions of climate change and environment.
2. It is perhaps also the first example of using climate change as an opportunity for reinforcing and developing a new trajectory of growth within a city-region.
3. It carries the potential for offering relevant lessons in the development of city-regional capacity and capability to shape infrastructure.

The three key lessons from the London approach are:

1. London's history and positioning implicate it as "the lead" and exemplar on issues of coordinating city-regional growth and critical infrastructures.
2. As the lead, and de facto national exemplar, key elements of the London model are effectively cascaded onto other city-regions through targets set by national government that are cascaded down through regional strategies and then to sub-regions and city-regions.
3. In this cascading process, a key issue is whether other city-regions actively interpret the London approach within the context of their own city-region or whether the London model is imposed on them.

Summary

As illustrated in Figure 1 London has the most complete and systemic set of responses to its short and longer term infrastructure requirements. Across the package of infrastructures there is a shared understanding of the infrastructure network and territorial issues in the longer term, the joint development and appraisal of options for providing a fix between these priorities, and with the sole exception of water, a clear sense of the strategic priority selected. London's understanding of its infrastructural requirements and both the scope and scale of its ambition is impressive and leads any other UK city-region.

Figure 1: London - Comparative Summary

	Transport	Waste	Flooding	Energy	Water
Shared understanding of problem					
Joint development of options					
Selection of solution					???

Case 2: Manchester Accelerated Growth Ambitions – Unblocking (partially) the Infrastructure

Challenge – attempting to ensure infrastructure is NOT an obstacle to growth.

The Manchester city-region (MCR) has developed significant new growth ambitions within the context of the Northern Way Growth Strategy (NWGS). These new ambitions represent:

- A doubling of the previous growth (economy, population and housing) targets and significant new demands on infrastructure networks.
- Priority for the MCR has been to anticipate potential constraints in realising the growth ambitions, particularly in relation to transport, waste and flooding, largely using external transition frameworks.
- The priority has been largely pro-growth seeking to ensure that ecological/environmental issues are not a constraint to the city’s ambitions.

Responses – Partial transitions in response to constraints

Effort has initially focused on short-term fixes as a response to infrastructure constraints, by “sweating assets” until the end of 2009/10 with recognition that more systemic change is required after 2010 when infrastructure could become a major constraint on growth. There are three key elements to the city-region’s approach (see Table 2).

Limitations, Opportunities and Lessons

The three key limitations of the MCR approach are:

1. It provides an uneven response to the infrastructural challenges of the growth agenda, which is weakest in relation to water and energy and which does not provide a strong base for a climate change response.
2. Transitions are currently largely externally driven via central government or cascaded through national and regional to city-regional targets and processes. This raises questions of the relevance, legitimacy and acceptability of these transitions.

3. Environmental and climate change issues are seen as a threat or constraint, not an opportunity for developing systemic responses that could promote growth and innovation.

The three key opportunities of the MCR approach are:

1. That capacity developed around transport and waste is high and is emerging with respect to flooding.
2. The lessons from work on transport, waste and flooding offer lessons to be translated in to action on energy and water issues.
3. There is the potential for MCR to develop its own model of how to respond to climate change that has a clear infrastructural dimension and is relevant not only to MCR but could also be developed in comparable/competitor city-regions.

The three key lessons of the MCR approach are:

1. The Manchester city-region is a recipient of transitions developed elsewhere and cascaded into the city-region. There is, therefore, the possibility that these are not likely to be innovative or possibly even ineffective.
2. Effort is still required in developing systemic approaches to transport and waste.
3. Environmental issues are seen as a constraint rather than an opportunity and are, therefore, unlikely to fuel innovation with MCR being seen as a follower not a leader.

Summary

As illustrated in Figure 2 MCR has a partial but increasing understanding of the issue involved in developing a fit between the city-regions infrastructure networks and its wider territorial priorities. This is most well developed in the transport sector, then followed by waste where a major study is considering different options prior to selection of a solution and then by flooding - where a major study is scoping out the nature of the problem at city-regional scale. However for both energy and water there is a much less understanding of the relations between territorial and network challenges.

Figure 2 Manchester City-Region Comparative Summary

	Transport	Waste	Flooding	Water	Energy
Shared understanding of problem				?	?
Joint development of options			?		
Selection of solution		?			

Table 2: Manchester’s Response – Partial Transitions

STRATEGY	KEY COMPONENTS
<p><i>1. Improvising systemic transitions in city-regional transport.</i></p>	<ul style="list-style-type: none"> • Recognition that major investment is required in intra-city-regional networks and that the governance framework needs strengthening. • National investment will only follow on the basis of a commitment to investigate congestion charging. • MCR has developed a well researched and understood view of a transport transition that is imposed on the city.
<p><i>2. Applying cascaded priorities to city-regional transitions.</i></p>	<ul style="list-style-type: none"> • MCR is applying policies, priorities and targets contained within national and regional policy frameworks in both waste and flooding to the scale of the city-region. • These are designed to send clear external signals and establish drivers that reshape the city’s waste and flooding metabolisms. • There is not yet a clear strategic sense of how these will reshape the city-region - these are seen as requirements to ensure that infrastructure does not constrain growth rather than part of an integrated approach to infrastructure and economic priorities.
<p><i>3. Absent Transitions – potential blockages to growth.</i></p>	<ul style="list-style-type: none"> • Water and energy are not well understood despite the existence of a set of city-regional targets, for example for decentralised and renewable energy, and the importance of both infrastructures in developing a response to climate change. • Existing assumptions underpinning investment planning are not sensitive to differential regional growth rates with the potential for a mismatch with the growth aspirations. • Existing targets for decentralised energy and renewable energy are unlikely to be met in the two other Northern regions and their city-regions and this could be replicated in the MCR and the North West. • There is no strategic view of what the city requires from its infrastructure and weak engagement with utility planning cycles. • MCR may find it difficult to develop a systemic response to climate change given the weak understanding of energy issues.

Case 3 Cardiff as the Capital City-Region – The Infrastructural Delivery Deficit?

Challenge – the emergence of Cardiff as a “capital” city-region

Three sets of pressures have created a new dynamic around the development of the Cardiff city-region.

1. The critical role of the Cardiff city-region in Wales in constituting over 50% of both population and economic activity.
2. There is emerging recognition of the critical functional and flow based interdependencies between the 10 local authorities making up the city-region.
3. Attempts to upscale the functionality and role of the city-region within Wales, the UK and Europe. Increasingly effort has focused on the critical infrastructures required to support this upscaling, within which environmental issues and climate change are viewed as key priorities.

Responses – Emerging and absent transitions

Infrastructure strategies have been primarily focused on two main approaches (see Table 3).

Limitations, Opportunities and Lessons

The three key limitations of the Cardiff approach are:

1. Sub-regional partnership is the only form of capacity at the city-regional scale in a context where there is still fragmentation and tensions between partners.
2. City-regional perspectives have been developed for economy, transport and waste but there is weak capacity to implement these transitions.
3. There is an absence of a strategic view of energy, water and flooding even when existing strategies have identified serious issues with energy issues at the city-regional scale.

The three key opportunities of the Cardiff approach are:

1. Prioritisation of the city-region by the Welsh Assembly Government (WAG) opens up potential for city-regionalising national strategies in relation to infrastructure.
2. Development of sub-regional capacity could be accelerated nationally by the WAG.
3. If the WAG takes environmental issues and climate change seriously as an agenda, then potentially it will create a focus on the Cardiff city-region.

Table 3: Cardiff’s Response – Emerging and Absent Transitions

STRATEGY	KEY CHARACTERISTICS
<p><i>1. Emerging visions of transitions but ‘improvisation’ in their delivery.</i></p>	<ul style="list-style-type: none"> • Sub-regional partnerships at the scale of the city-region have developed transport and waste strategies to integrate movement and waste management in the city-region. • While there is some strategic capacity and financial resources for the implementation of transport priorities the capacity for implementing waste priorities is very limited. Consequently there is a serious delivery deficit. • Given the absence of any strategic resolution of these issues the city-region is currently exploring the development of its own transport strategies, with private sector partners, and is also investigating the use of congestion charging as a funding mechanism.
<p><i>2. Absent Transitions – potential constraints on growth.</i></p>	<ul style="list-style-type: none"> • Energy appears to be a potentially serious constraint on the city-region’s growth ambitions – given the strategic need for strengthening networks, the high cost of additional infrastructure and the need for decentralised energy and renewable energy generation. • But the only city-regional capacity in this regard focused on energy efficiency and conservation issues largely focused on retrofitting existing development – although this is important it is not strategically oriented toward production and distribution issues. • There is very little sub-regional capacity with regard to flooding and water and waste disposal issues. Most strategies are Wales-wide and it is not currently clear if these infrastructures are strategic constraints at the scale of the city-region.

The three key lessons of the Cardiff approach are:

1. The value of a national policy framework in recognising the role of the city-regional within national spatial strategy – but a delivery deficit through sub-regional partnerships.
2. It is not clear how capacity is developed - particularly given the tensions within the city-region – and unblocking is required from the WAG.
3. Energy, water and flooding appear to be weakly city-regionalised.

Summary

Figure 3 provides a summary of the Cardiff city-regions strategic framework for finding a fix between its infrastructure requirements and growth ambitions. As currently configured these are relatively well developed for transport where there is a capacity for implementation. Despite the existence of a strategic framework for waste, the capacity for implementation across the city-region is weak. There are no city-regional perspectives on flooding and water and their potential to act as a constraint on development is not known. Energy issues have been identified as a potential constraint with little network capacity available for new demand and the need for investment in renewable and conventional generating capacity.

Figure 3 Cardiff City-Region Comparative Summary

	Transport	Waste	Flooding	Water	Energy
Shared understanding of problem			?	?	?
Joint development of options					
Selection of solution	?	?			

Case 4: Scottish City-Regional infrastructure – “Missing Transitions and Making Do”

Challenge - Bending infrastructure to support city-regions as national drivers?

Major investment in research and analysis identified the critical role of city-regions in the economic, social and environmental development of Scotland. There is an apparent national policy commitment that recognises the need to prioritise investment and policies for city-regional development which is primarily being implemented through a new focus on the development of city-regional Strategic Development Plans (SDP) for coordinating priorities, including infrastructure. But there are serious difficulties in reshaping existing national infrastructure investment plans and priorities around the city-regional scale.

Responses – Missing transitions

There are three elements of the Scottish approach (see Table 4).

Limitations, Opportunities and Lessons

The three key limitations of the Scottish approach are:

1. An apparent national prioritisation of city-regions is not translated into national infrastructure strategies, which could be a serious constraint on growth.
2. There is a focus on the potential of city-regional development plans, especially in relation to infrastructure, but this is not backed up by a clear sense of city-regional priorities – with the possible exception of work on transport.
3. A focus on improvising in order to fill a delivery deficit through more ad hoc approaches for transport, flooding and water, but an absence of activity on energy.

The three opportunities of the Scottish approach are:

1. There is potential for developing a strategic vision through building on existing ad hoc approaches that can then provide a more formal input into infrastructure planning.
2. The potential for city region Strategic Development Plans (SDP) for providing a mechanism for more strongly connecting economic aspirations with infrastructure requirements – providing they can shape investment priorities and plans.
3. There is also the possibility to explore the potential for creating a distinctively Scottish fix that builds on higher renewables and carbon reduction targets in Scotland and recognises infrastructure assets, especially in relation to energy.

The three key lessons of the Scottish approach are:

1. The importance of national support – but which is not always forthcoming.
2. In the context of a lack of strategic direction, an approach focused on improvisation and making do.
3. The potential for using city-regional strategic development frameworks for developing a stronger city-regional perspective on infrastructure needs and for shaping national infrastructure plans and investment priorities.

Table 4: Responses – Missing transitions

STRATEGY	KEY CHARACTERISTICS
<p><i>1. National frameworks - missing infrastructure transitions for city-regions</i></p>	<ul style="list-style-type: none"> • Overall the storyline is one where there is significant progress in the development of an analysis and priorities for city-regions at national level. • But these priorities have not been translated into national infrastructure plans that largely tend to be aspatial and do not prioritise city-regions. • It is claimed that new city-regional Strategic Development Plans will provide a formal context for reshaping national priorities but there is a concern that this will not reshape priorities.
<p><i>2. “Making do – improvising transitions”.</i></p>	<ul style="list-style-type: none"> • The city-regions have increasingly focused on attempting to develop their own views of transitions. In the case of Glasgow this is mainly focused around transport and water. • Given an absence of a wider framework there are considerable efforts at improvisation, with the development of public private partnerships to develop new arrangements for water investment and flooding protection. • At this stage there is little activity around energy and waste although city-regions raise these networks as infrastructural constraints.
<p><i>3. External views of transitions.</i></p>	<ul style="list-style-type: none"> • With the absence of strategic views at the level of the city-region there have been a number of external attempts by NGOs (Greenpeace) and professional organisations ((Royal Institution of Chartered Surveyors) to envision reconfigured transport and energy infrastructures for the city-regions. • These include strategies focused on the development of decentralised energy and renewable energy and the type of strategies required to hit carbon emission targets in the transport sector. But these are not tied into national Scottish strategies or priorities. • There appears to be missed opportunities, particularly when considering Scotland’s more ambitious renewable energy targets and the potential for powering its city-regions using clean fuels.

Summary

Figure 4 summarises the situation in the Glasgow city-region. Significant progress has been made with respect to transport – although there are still serious concerns that city-regional priorities are not actively translated into national infrastructure plans and priorities. In comparison to the other case studies water is seen as potential constraint on the development of the city-regions growth ambitions and work with public and private sector partners is underway to investigate alternative options for future investment. There is a lack of clarity about whether waste, flooding and energy issues could act as a future constraint on city-regional growth ambitions.

Figure 4: Glasgow City-region Comparative Summary of Problems, Options and Solution

	Transport	Water	Flooding	Waste	Energy
Shared understanding of problem			?	?	?
Joint development of options		?			
Selection of solution	?	?			

3. City-Regions and Managing Critical Infrastructures - Five Strategies

Drawing on the key issues emerging from the city-region case studies, in this section we detail five strategies which exemplify city-regional approaches to managing critical infrastructures. These five strategies are not prescriptions but outline different approaches to addressing the tension between city-regional growth and critical infrastructure provision and achieving an accommodation or “fit” between the two issues in different city-regional contexts. It provides an overview of current different approaches to addressing the relationship between city-regional growth and critical infrastructure provision.

Strategy 1: Actively Re-scaling City-regional Infrastructure

Strategy 1 focuses on the active re-scaling of infrastructure. It is primarily concerned with developing and building-up infrastructure from small-scale decentralised technologies to the development of city-regional systems such as pricing or mobility infrastructures. This is a strategy of developing infrastructure at the city-regional scale in the context of continuing economic growth, dealing with the causes and consequences of global warming, including the production of greenhouse gas emissions, air quality, potentially rising threats of flooding and the security of supply of resources. There are three key characteristics of such strategies:

1. Although the issues above are ‘driving’ the strategy of actively re-scaling infrastructure a clear political will, vision and powers is necessary in actively responding to them. This political will is necessary to articulate a clear and shared view between political and infrastructural priorities about the extent of network

problems for city-regions. The importance of political will highlights the anticipatory and purposive need to actively re-scale infrastructural provision. Important is not just a strong political will but also being able to clearly articulate this through a vision and a series of strategies for different infrastructures.

2. Strategies can be translated into action through specialist intermediaries developing plans, initiatives and demonstration projects. This may, for example, involve transport demonstrations (e.g. hydrogen and diesel-hybrid buses) and initiatives (congestion charging), initiatives to develop combined heat and power capacity and renewables (energy) or through water re-use and efficiency measures embodied in new planning hierarchies. These are often developed collaboratively between cities and with corporate partners.
3. The timings of transitions differ in terms of both city-region and infrastructure, but can be generally categorised as ‘long-term’ (i.e. 25 years and over). Having said this, the process through which this long-term transition takes place consists of short-term timeframes. So, for example, in actively up-scaling new infrastructures there is a process whereby new infrastructures are experimented and tested-out. This often involves a city-region working in a network of other city-regions and with corporate interests to demonstrate and develop infrastructural technologies but can also involve initiatives at a local-level.

A strategy of up-scaling infrastructure is actively expansionary in the sense that its rationale is one of constructing a new logic of provision in city-regional context.

Strategy 2: Actively Decoupling to Increase Infrastructural Resilience

Strategy 2 takes as a concern the active decoupling of infrastructure. This in many respects is the opposite side of the coin of actively re-scaling infrastructure. Whereas the previous strategy is concerned with actively building-up infrastructure to secure a degree of city-regional ‘self-sufficiency’, actively decoupling infrastructure may require a degree of (but not complete) withdrawal from national and regional provision (e.g. the national grid) as part of an overall approach to organising infrastructure at a city-regional scale.

The drivers for decoupling are complex and often contradictory but include a range of pressures and objectives: commitment to create a more self-sufficient urban metabolism to reduce the ecological footprint of the city; developing increased security of supply at a city-regional scale given the potential challenges of increased disruption (terrorism, climate events, supply uncertainty etc); refocusing investment away from national infrastructures to strengthening city-regional infrastructures that facilitate expansion of decentralised technologies within the city-region; creating room for manoeuvre in trading carbon reduction in an infrastructure such as energy with increases in another such as international air travel; and, developing a new logic of infrastructural development, with other world cities, that can be applied in other contexts.

Decoupling is based on partial withdrawal from collective national and regional provision and the acknowledgement, as set-out in Strategy 1, that more infrastructural provision can occur at a city-regional scale. This requires city-regional capacity and capability to manage demand for services and also to develop alternative local sources of supply within the city-region. Tangibly this could mean, for example, not only a degree of withdrawal from the National Grid but also a declining proportion of waste being “exported” beyond the

parameters of the city-region to regional and rural hinterlands. Processes of withdrawal are often partial and reflect a shift in the balance between national/regional provision and city-regional provision. In particular, some large scale infrastructure projects still require a key role for national government, for example, in the case of large-scale flood defences.

This approach raises critical issues about the degree to which certain infrastructural priorities become prioritised and others ignored. For example, this approach seems to signal a logic that is focused on cells of increasingly resilient and more self-sufficient global city-regions that are more closely connected with each other through international linkages than they are with their own national urban systems.

Strategy 3: “Making-do” the Uncoordinated and Ad-hoc Expansion of Infrastructure in Response to Growth Pressures.

Strategy 3 deals with the purposive, anticipatory and above all strategic expansion of infrastructure. That is to say, re-scaling of infrastructure is in response to a political will or purpose. Where city-regions are faced with what are clearly and commonly recognised as problems, expansion of infrastructure provides an answer or is part of a solution to these problems.

Where there is no coherent and clear agreement between different political interests and also a variety of infrastructural providers there is likely to be an ad-hoc development of new infrastructural provision which is piecemeal rather than strategic. Problems are likely to be addressed on a “firefighting” basis or in multiple different ways rather than as part of a common strategic approach. Perhaps the best examples of this would be the controversy over flooding in Manchester-Salford Partnership (MSP) and the tensions at the North West Regional Spatial Strategy Examination in Public. Future controversies might include: the cost availability of a power network to meet rapidly rising demand in the regional capital, not meeting decentralised and renewable energy targets, future carbon reduction targets constraining growth, long term threats of climate change and so on. Strategic intervention is difficult because responsibility for infrastructural provision is more fragmented in the context of privatisation and liberalisation and city-regions are an emerging rather than an established form of territorial political organisation. In this respect, whilst some city-regional contexts may have a long institutional legacy, others may need building from existing local and regional contexts.

The development of initiatives or demonstration projects (e.g. photovoltaic panels on the Manchester Co-op Tower) may be isolated or standalone and not linked strategically to (unformulated) city-regional transport, waste, flooding, water and energy priorities. The pressures on city-regions, for example, to address emissions targets and to secure the provision of critical infrastructures, is met with a series of ad hoc responses rather than a common strategic city-regional response. The consequence is a series of initiatives and demonstrations which may or may not overlap, but which are not strategically and purposively developed together.

The distributed nature of both political and infrastructural interests means that not only are different initiatives to upscale new infrastructures undertaken largely on an ad hoc basis, but also there is a significant challenge in developing the necessary capacity and capability to address city-regional infrastructure issues strategically.

Strategy 4: Developing a “DIY” approach to systemic transitions

Strategy 4, at first sight appears paradoxical – i.e. how could there be an unstrategic decoupling from existing infrastructure provision? What happens when the capacity of infrastructure networks is insufficient to meet demand at a city-regional scale? Where, for example, when there is growth in population and economic activity and hence demand but a disconnection between both different political and regulatory interests and also infrastructure providers.

Given a lack of a common and coherent response from political and infrastructure interests one de facto strategy is that there are a multiplicity of ad hoc responses as, having reached capacity, responses to this seek to find solutions which by-pass existing infrastructure provision. These could involve three different approaches:

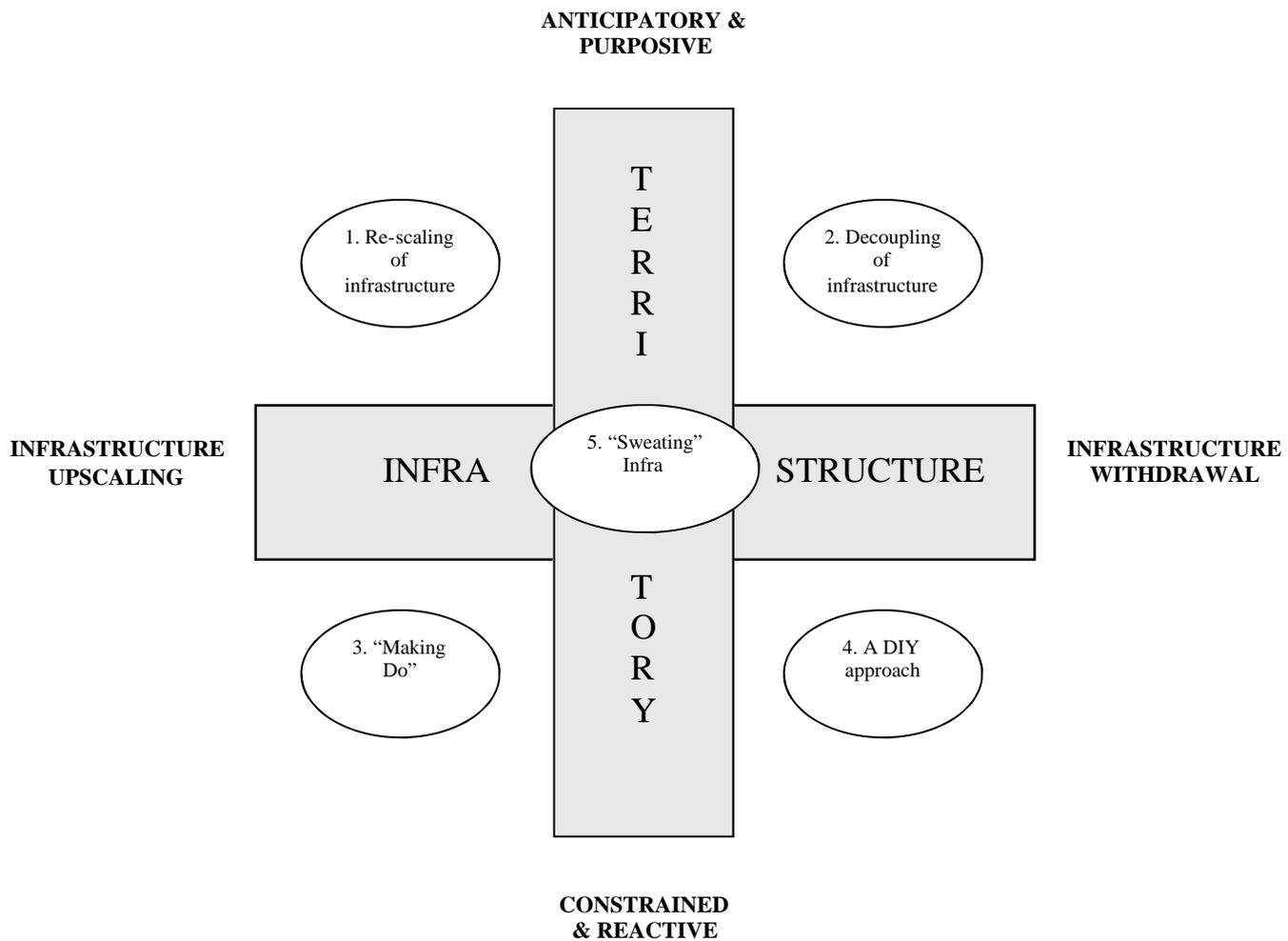
1. Improvising strategies – attempting to develop a system transition by negotiating flexibility with a national or regional government. For instance MCR can only realise its transport ambitions by working within national constraint of developing congestion charging.
2. Applying cascaded priorities to the city-regional transitions. This basically means applying a set of national and regional priorities, processes and targets to the city-region. It implies an externally-directed transition that is not necessarily based on local priorities or opportunities.
3. Emerging visions and improvised delivery. New partnerships and priorities are being developed in both the Cardiff and Glasgow context to try to unlock infrastructural constraints at the national and regional level.

Strategies 3 and 4 are in many ways polar opposites of strategies 1 and 2. Strategies 3 and 4, whilst focusing on upscaling and decoupling do so in terms of an ad hoc approach rather than the anticipatory approach (of strategies 1 and 2).

Strategy 5: Sweating Infrastructures

Strategy 5 is one of sweating existing infrastructures. In the short-term or short to medium-term this is about making more efficient use of existing infrastructure capacity by finding ways of squeezing more demand on the networks. Under this new logic, providers are developing strategies to ‘sweat assets’ to gain more capacity through packages of softer control and demand side measures to shift the timing, location or the intensity of resource use. Such measures include waste reduction, water and energy efficiency, and travel demand packages to develop a more balanced approach to supply and demand. This is part of a wider refocusing on the potential of decentralised technologies (micro-generation) and control systems (smart traffic control and metering) that can co-exist alongside centralised networks. This is almost the do-nothing-much-different option and it is about getting more from existing configurations rather than the active or even ad hoc transformation of existing infrastructure provision.

Figure: 5 Strategies in City-Regional Infrastructure Transformation



4. Lessons and Limits in Organising and Achieving ‘Fit’

None of the different case studies fit neatly in to a particular strategy, rather they often reflect a pick-and-mix of different aspects of each strategy (see Figure 5). But we can begin to see where different city-regions are positioned on the diagram and begin to get some sense of the challenges involved in developing a more effective fit between infrastructure and growth ambitions. There are 5 key lessons:

1. London has the capacity and capability to be a generator of system transitions that include environment and climate change. Only London can develop such a strategic approach – therefore it is positioned in the top half of the diagram across strategies 1 and 2. It actually develops a model that is then cascaded on to others – but is this relevant and can it have legitimacy?
2. MCR is the next most well-developed city-region but has only a partially developed sense of transitions. MCR is basically still a consumer of transitions developed externally and in this sense there is constrained adaptability. Infrastructure is configured as something to be overcome rather than as in London as an integral part of a city’s future development strategy and emblematic response to climate change.

There is a requirement to consider how it can extend the development of capacity into energy and water and then into climate change. Currently MCR exemplifies elements of an imposed version of Strategy 1, with a strong focus on Strategy 2 and some elements of Strategy 3.

3. Cardiff is an emerging city-region and having to experiment with a delivery deficit. It is not clear if key infrastructure is a constraint – although energy will certainly emerge as such but it is unclear whether this is the case with water and flooding. Given a national commitment to city-regions much depends on whether the governance model is unblocked by WAG intervention and whether the city-regional is rescaled as a priority in other infrastructure plans. If so there could be a rapid development of infrastructure capacity to meet growth but with significant tensions and priorities to be overcome. Cardiff currently exemplifies most clearly aspects of Strategies 3 and 4.
4. Scotland is almost entirely focused on Strategy 4 and some of Strategy 3 in relation to transport and water. There remains a critical gap between policy priorities and national strategies with difficulties remaining as to how cities can realise growth ambitions and infrastructural priorities.
5. Sweating assets is a strategy for all cities but it is clear that this is not a long-term approach, although there is uncertainty about when this runs out and constraints and growth restrictions.

5. Conclusions and Recommendations

There are 5 key conclusions that emerge from these city-regional different strategies for developing a fix between infrastructure and growth ambitions:

1. It is difficult for city-regions to purposively shape all their critical infrastructure networks in order to attempt to ensure that infrastructures are prepared to meet their growth ambitions and meet wider environmental and climate change challenges.
2. Only the most powerful and capable cities such as London with well developed governance structures have the capacity and capability to develop a full suite of long term strategies and start to deal with climate change in a strategic manner. But then even these cities can only attempt to find a fix - they cannot absolutely guarantee their effective implementation.
3. Networks of these world cities are collectively developing an emerging logic of infrastructural development in response to their economic growth ambitions and ecological challenges that it is assumed can be transferred to other city-regions (in the UK and elsewhere).
4. This emerging logic is often cascaded down on to city-regions by national government devolving national targets to regions that are then cascaded down to sub-regions - for example resource savings, decentralised energy etc. But the Northern city-regions do not have London's governance capability and consequently there are implementation gaps and or missing transitions.

5. Northern city regions have constrained adaptability both in their capacity and capability in shaping their infrastructure assets. We have seen how Manchester has worked within these constraints to develop a partial set of transitions in its critical infrastructures, but still have a poorly understood view of the role and significance of water and energy.

The challenge for Northern city-regions is to develop and enhance their capacity and capability to frame their own responses to critical infrastructure especially for water and energy issues. The key recommendations for the Northern Way Sustainable Communities Team (NWSC) to communicate to the Northern city-regions and Manchester City are:

1. Undertake further assessments of the degree of “fit” between the critical infrastructure networks and the growth ambitions of the Northern city-regions. The assessment methodology presented in this research provides a mechanism for rapidly and effectively identifying the resonances and dissonances between city-regions infrastructures and the growth ambitions. This would then provide a more thorough and systematic understanding of the degree of fit between the Northern city-regions growth and infrastructure priorities and identify key gaps and missing transitions.
2. Review and exchange the relevant and transferable experiences, between the Northern city-regions, nationally and internationally. Certainly for transport, waste and flooding there appears to be ways in which city-regions, certainly MCR, have been able to select from the national and regional policy frameworks to develop the capacity and capability to start developing more systemic transitions in these sectors. There would be considerable value in comparing experiences, practices, priorities and implementation. There may be value in working together on common issues and themes that are distinctive to the Northern city-regions.
3. Prioritise the development of shared approaches between the Northern city-regions to the shaping of their water and energy infrastructure. This is the most significant gap in the package of critical infrastructure strategies – it is not clear if these infrastructures will present significant constraints on the new growth ambitions. Capacity and capability is currently weakly developed for these infrastructures. While London may offer a model of a way forward it has been active on energy issues since the late 1970s and this capacity was kept together after the abolition of the Greater London Council and prior to the creation of the Greater London Authority. Significantly this capacity has been built upon to develop the capability to produce the London Water Framework and the strategic response of the London Climate Change Agency.
4. Work with the Northern city-regions to build the capability to create a strategic understanding of their energy issues and then use this as a step towards developing a systemic response to climate change. All Northern city-regions will face increasing pressures to meet the dual objectives of their economic growth ambitions and reduce carbon emissions. Such capacity does not currently exist in any strategic form and needs to be urgently developed. There may be opportunities for sharing the initial feasibility work and the model of development by working across Northern city-regions.