Green Cities Position Paper

Version 1 for Discussion and Feedback

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Contents

Summary

Purpose

This position paper is designed to stimulate thinking about the development of a comparative green cities research agenda that could be undertaken by MUF. The aim of the paper is to act as a prompt and a stimulator of our collective thinking about the 'why, what and how' of organising a green cities programme. Such a programme would need to be distinctive by addressing a particular 'niche', address research and policy questions and be comparative across the LIP contexts. The paper provides an overview of the main green city debates with a particular focus on those that have developed since 2000. It also builds upon the thinking that was developed in the Green Cities session at the Manchester MUF meeting in 2012. The brief was to primarily focus on the environmental issues associated with infrastructure and resource flows.

Green Cities

There are three significant issues that are reshaping the wider context in which debates about green cities are currently being undertaken.

1. The importance of the contemporary economic crisis and the implications of austerity governance for how green city priorites are viewed and whether the response is about more economic growth, a form of green growth or even an alternative conception of growth.
2. The wider acceptance that human induced processes including urbanisation are producing anthropogenic global ecological change best exemplified by climate change that is reshaping the context within which cities are attempting to ensure their reproduction.
3. The final issue is whether taken together these changes are producing responses that are leading to the emergence of new green niches that re-prioritise and re-intensify the economic, technical and security dimensions of green cities at the expense of wider questions of social justice and the social control of infrastructure and critical resources.

Potential Green City Niches

The paper then explores seven emerging niches of green city development that have emerged from the research and / or policy literature:

1. Urban Resilience
2. Urban Flows and Decoupling
3. Carbon Regulation and Urban Low Carbon Transitions
4. More Growth, Green Growth or Beyond Growth for Cities
5. Smart Urbanism: Smart Grids and Smart Cities
6. Urban Securitisation
7. Experimental Green Cities as Test-Beds

The paper identifies the main features of each response, the implications for infrastructure and resources, and the key research issues associated with these emerging niches as a way of configuring a discussion with the LIPs about their relevance in each urban context.

Key Issues

There are three core issues:

1. That there is evidence of increasing emphasis in urban responses upon the economic, technological, climate and security dimensions of green cities in the period since 2000.
2. The critical question for cities becomes focused around how in a period of austerity and global ecological change they are able to develop the capacity and knowledge to ensure continued access to infrastructure and resource flows to ensure urban reproduction and stimulate growth.
3. Given the potential narrowing of the green cities agenda the critical challenge then is to explore ways of widening the agenda of issues discussed, opening up the debate to a more inclusive set of social interests and developing responses that seek to build collective rather than bounded security.

There is potential to examine these three issues in a systemic and comparative way across the LIPs.

Next Steps

There are three parts to the next steps that are undertaken jointly between the LIP and UF Arena with the objective of co-producing clarity about the potential options for the design of a MUF research programme on green cities.

The ***core questions*** and issues to explore with the LIPs are three-fold:

- What evidence is there of a re-focusing and re-intensification of green city priorities on economic, technological, security and carbon control priorities?
- How relevant are the emerging green city niches in each local context and which are dominant, weak or even absent? Are there any other niches emerging in the local context not reviewed in the paper?
- What are the resonances and dissonances between green cities niches in each LIP and the implications of this for the design of a comparative project?

The ***process*** designed to explore these issues is:

- The LIP directors provide feedback on each of the key questions to the UFArena.
- A telephone discussion to explore the responses from each LIP.
- The production of a short synthesis report looking at the resonances and dissonances between the LIPs and the identification of options for how the research agenda could be developed.

The ***output*** from this process will be:

- An overview of the green cities priorities for the MUF.
- An initial orientation from the LIPs (to be further developed) of the critical green cities issues within each local context, the relevance of the questions raised in the paper and the identification of missing issues and questions.
- An initial draft of a shared orientation focused around the identification of up to three options for taking forward the research agenda collectively in terms of why, what and how it might be organised.

1. Introduction

1.1 Aim and Objectives

This paper has been produced by the UFArena with the aim of stimulating debate about the potential options for the future development of a comparative Green Cities research programme in MUF. The purpose of the paper is three-fold:

1. To review whether new conditions and pressures are reshaping the context in which existing debates about green cities are being framed?
2. To identify what new green niches have started to emerge from this context and how they could become the focus of a green cities programme?
3. To ask the LIPs whether they can identify these new pressures and specific niches in their own urban contexts?

This will then contribute to the identification of options for the development of a collective and comparative green cities programme.

1.2 Delimiting the Boundaries of the Paper

In developing the brief it was decided that it would be necessary to delimit five boundaries for the work given the broad scope of the green cities agenda:

First, temporally the paper places existing green cities in the wider historical context of its emergence as a critical debate in the early 1970s in response to questions about ecological limits. Understanding this longer-term context then allows us to think about the specificity and distinctiveness of green cities development in the period since 2000 - particularly over the last five years. The rationale for this was two-fold. The original MUF programme was produced in 2007 so we were particularly interested whether there was anything distinctive about green city debates that had emerged since that time. Additionally this also coincided with the start of the financial crisis and we were interested in economic austerity was reshaping the green cities debate.

Second, that normatively the main policy issues that we would focus upon related to the issues associated with socio-technical infrastructures and critical resource flows around energy, water, waste mobility etc. This enabled us to delimit the selection and discussion of emerging niches to those that primarily had implications for infrastructure and resource flows. There are also likely to be overlaps with the two other position papers on density and fairness.

Third, that spatially the paper would not focus on the LIP contexts in particular at this stage. Instead the paper was designed to consider wider pressures and challenges and the styles of responses – constituted through the niches - that were emerging in cities of the global north and south. The next steps of the process would then allow the LIPs to identify the relevance of these generic trends and specific niches in their own local context.

Fourth, that evidentially the paper would be based on both research publications and policy responses. This also implied that the audience for the paper should be both a research and policy audience. The language and style of the paper was therefore to be accessible to all partners involved in MUF and within the LIPs. However, different elements of the paper could then be published in appropriate contexts depending on the

audience targeted.

Finally, that the purpose of the paper was to stimulate dialogue therefore the paper was not supposed to identify a single option at this stage. The purpose is to provide a basis for engagement and dialogue with the LIPs to develop the more detailed responses about the content and organization of a MUF programme.

1.3 Structure of Paper

The rest of this paper is then structured into four sections.

- Section 2 provides a review of the changed conditions of green cities discourse particularly focused on building an understanding of how the concept has been understood and changed since the 1970s focusing on what is distinctive about the contemporary debate.

- Section 3 identifies seven emerging niches of green debate and briefly outlines their distinctiveness and the potential research and policy challenges raised.

- Section 4 identifies the main conclusions, the potential research questions and the options for organizing a comparative programme.

- Section 5 outlines the next steps in taking the paper forward.

2. Green Cities: Transformation or Intensification?

In order to develop a distinctive and innovative MUF agenda on green cities at the start of the twenty-first century we need to place contemporary debates in a wider developmental context. This is necessary in order to identify the changing dynamics of green cities debates over time – the critical drivers and pressures, the styles of response developed and the social and material implications. Understanding changes in these dynamics over longer time periods then allows us to identify wider systemic issues and research questions that could constitute the basis for a distinctive MUF programme. Consequently below we consider the dynamics of green cities development since the 1970s in order to identify the critical questions that are emerging in the 21st century. In particular we ask whether current green cities debates are transformative in their aspirations or whether there is in fact a much tighter intensification around a narrower techno-economic responses? In this tension between transformation and obduracy a distinctive MUF green cities agenda could emerge.

2.1 The Re-emergence of Ecological Concern

The idea of green cities is not a new one. Questions of ecology and development have been visible regularly since early phases of urbanisation and industrialisation in the first part of the nineteenth century. There are resonances with the idea of green cities, for example, in the work of Engels on the condition of the working class in Manchester in the middle of the nineteenth century, the work of Ebenezer Howard on Garden Cities at the end of the century, in the architecture of Le Corbusier in the first half of the twentieth century and the New Towns movement in the UK in the second half of the twentieth century. Indeed even in contemporary debates there is the use of a wide range of terms from green cities to eco cities and from sustainable urban development to sustainable environmental management.

Contemporary green cities' debates, though, can be understood as emerging out of the multiple crises – economic, ecological, of industrial capitalism and urbanism – particularly as they were perceived by Western nation states in the late 1960s and 1970s. Environmental politics as an urban concern resonated with questioning of the role of cities in industrial capitalism and with processes of urbanisation and the environmental consequences of this, particularly issues of pollution and quality of urban life. Environmental questions of the cities of the north were also increasingly pertinent to the global south given the rapid growth of cities in the south.

These issues were addressed at the United Nations Habitat Conference on Human Settlements in Vancouver in 1976 where the contemporary challenges posed by urbanisation were debated including: the challenges of providing clean water and sanitation, of addressing poverty and homelessness, posed by shift of populations from rural to urban centres and the possibilities afforded by sustainable urban design. This was part of a wider 're-emergence' of ecological concern in the 1970s. The 1972 United Nations Conference on the Human Environment in Stockholm had convened representatives of more than one hundred countries, various agencies and hundreds of non-governmental organisations that produced 26 principles on the environment and development, an Action Plan and recommendations that contributed to a re-emergent and nascent 'global' view of the relationship between environment, development and urbanisation.

This emerging view was also accompanied in 1972 by the publication by the Club of Rome of *Limits to Growth*, that questioned the relationship between finite resources and

economic and population growth and used computers to model the future of the world in respect of accelerating industrialisation, rapid population growth, widespread malnutrition, depletion of non-renewable resources and a deteriorating environment. Their conclusions were stark. If the then current trends in world population, industrialization, pollution, food production and resource depletion continued unchanged then the limits to growth would be reached 'sometime within the next one hundred years' (Meadows et al, 1972). Other texts were published at around this time, such as *Blueprint for Survival*, (Goldsmith and Allen, 1972), *Small is Beautiful* (Schumacher, 1973) and *Towards a Steady-State Economy* (Daly, 1973) that added to this sense of ecological breakdown and crisis and also of an approach to organising economic activity on the basis of unfettered growth and that set out smaller forms of ecological organisation and alternative forms of economic organisation.

The broad view that was developing in the 1970s was of a developing ecological crisis, the role of industrial capitalism and urbanisation in producing this and the need for radical responses. This was more specifically framed through seeing the problem to be addressed as one of pollution and the need to regulate at national level for environmental protection. This was also important in framing a role for cities as producers of environmental problems. But it also laid the foundations for thinking about how cities could be viewed not only through the relationship of economy to ecology but also how this relationship could be re-worked.

Cities were being positioned as sites where the relationships between economic organisation, ecological consequences and environmental responses and social organisation could be managed. This, of course, raised numerous fundamental issues about conceptualisations of sustainability and about what was meant by the term. What was being sustained, why, how, when, for whom, by whom, and how would we know? It also made the forms of social organization of response key.

2.2 Institutionalising Green Cities and Multi-Level Governance

By the late 1980s the radical forms of response that were being raised in the 1970s had undergone a process of being replaced by the view that the ecological crisis could be solved through an agenda developed and enacted through society's existing institutions. This view was most notably made by the 1987 World Commission on Environment and Development (Brundtland Report), *Our Common Future*. The Brundtland Report set out the (still) commonly used definition of sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland Commission, 1987). In doing so it took the view that 'sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations' (Brundtland Commission, 1987). In seeing sustainable development processually, the Bruntland report pointed out it was 'careful to base our recommendations on the realities of present institutions, on what can and must be accomplished today' (Bruntland Commission, 1987).

In doing this Brundtland was critical in framing the need for a response to the ecological crisis that could be attractive and also incorporated into the agendas of large international agenda setting organisations such as the World Bank and IMF. This approach to sustainable development, that was acceptable to global economic organisations, also meant that Bruntland, for radical critics, develops sustainable development as a concept that is 'a rhetorical ploy which conceals a strategy for

sustaining development rather than addressing the causes of the ecological crisis' (Hajer, 1995, p.12) and which accepts notions of continued growth.

The key point from the point of view of green cities' debates is that the global institutional architecture - UN, World Bank, IMF, and OECD - was increasingly being reconfigured around a view of sustainable development that was based on a broadly shared approach and set of concepts. The significant implication of this was that rather than episodic responses a broadly shared approach was incorporated into a suite of existing international institutions. What followed from this was the need for national and sub-national action on sustainable development as the agenda cascaded down from institutions as part of a new multi-level governance of sustainable development.

Agenda 21 was the non-binding action plan on sustainable development that was developed at the Rio summit. It set out an approach to sustainable development that dealt with addressing poverty, health and population issues but also the control of pollution, protecting and conserving biological diversity and fragile environments, strengthening the role of NGOs, local authorities, businesses and other societal groups and where there was emphasis on the means of implementation. Indeed, as part of Agenda 21, through the principle of subsidiarity and the view that local authorities were agencies that were close to the people, Local Agenda 21 was proposed. Local Agenda 21 comes out of Agenda 21 and in particular Chapter 28 'Local Authorities' Initiatives in Support of Agenda 21'. As is pointed out in chapter 28:

> 'Because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives. Local authorities construct, operate and maintain economic, social and environmental infrastructure, oversee planning processes, establish local environmental policies and regulations and assist in implementing national and sub-national environmental policies. As the level of governance closest to the people, they play a vital role in educating, mobilizing and responding to the public to promote sustainable development' (28.1).

Pushing this further, this meant that by 1996, most local authorities, having gone through a process of consultation with their population, should have achieved a consensus on their Local Agenda 21; that by 1993 the international community should have initiated a consultative process aimed at increasing cooperation between local authorities; and by 1994, representatives of local authorities should have to increase cooperation and coordination of information and experience, and that all local authorities should be encouraged to implement and monitor programmes to ensure women and youth are represented in decision making, planning and implementation processes (28.2).

What this meant was that local authorities should be engaged in picking and mixing policy measures in context – in relation to different prescribed elements of an overall sustainable urban development or sustainable cities agenda. This picking and mixing usually involved green architecture and buildings, transport, energy, green space, social and environmental justice and economic development. Through Local Agenda 21s sustainability became enshrined in urban plans and policy where cities were central to the problematic of global ecological 'crisis' and sustainability and through local plans and new forms of local partnerships and interrelationships constituted a response. Local authorities were encouraged to build a Local Agenda 21 plan through dialogue and creating consensus between local citizens, local organizations and private business.

Partnerships should also be built with international organizations such as UNDP, UNEP, Habitat and others to build local capacity and to build networks and exchange with other cities. This emphasis on shifting the terms of the debate from the 'problem' of cities to the potential of cities as contexts of response was also central to the 1996 Istanbul United Nations Conference on Human Settlements (also known as Habitat II). This was important in highlighting the resource flow potentials, the concentration of production and consumption and possible financial benefits of this, the health benefits, the potential for addressing transportation congestion, reduced relative demand for land of high density urbanism and the possibilities of the 'social economy'. Central to all this was that: 'Making full use of the potential that cities have to offer requires "good governance"' (UNCHS, 1996). The concept of capacity to act on sustainable urban development thus became bound up not only with the parameters of desirable action set out through 'global' agreements but also through the city's relationships with global institutions, endogenous city relationships and also horizontal networked capacity with other cities through networked institutions or associations of local governments such as ICLEI.

Brundtland and particularly the Rio Summit were important in setting cities not only as problems but as sites of response and thus in setting expectations about what local authorities should do where 'one of the important outcomes of the Rio Summit was not so much the recognition of a problem but the formalization of a solution'. It 'shifted the focus from diagnosis to action whilst at the same time sealing off any fundamental consideration of the nature of the problem. It developed a framework of institutional and policy initiatives for reorienting economic and social practices in favour of more environment friendly strategies of production and consumption' (Brand with Thomas, 2005, p.6). The importance of this is in the framing of a separation between economy, society and environment, the bringing to bear of an instrumental rationality to processes of managing change and practical action, with the monitoring techniques of managing sustainability that go along with that and the narrative of disaster and catastrophe that are framed within a modernist view of history and progress.

This has produced a 'win-win' view of the relationship between economy and ecology that is based on a 'policy discourse of ecological modernization [that] recognizes the ecological crisis as evidence of a fundamental omission in the workings of the institutions of modern society. Yet, unlike the radical environmental movements of the 1970s, it suggests that environmental problems can be solved in accordance with the workings of the main institutional arrangements of society' (Hajer, 1995, p.3).

Following this view brings a practice of green cities where the management of social and environmental concerns are predicated on the proceeds of economic growth. The dominance of this view through the 1990s and into the 2000s within national governments, city authorities and other agencies was apparent in the EU, North America and other areas of the world. This was a consensual view of the management or an accommodation between notions of economic competitiveness, social justice and environmental protection that was thin on conflict in what has been characterised as an era of post-politics (Swyngedouw 2009).

Running concurrently to the economic, ecological and urbanisation crises of the 1970s was a challenge to post-Second World War forms of governing and the rise of public institutions. They were challenged at the level of economic organisation with their regulatory roles in supporting Fordist-Keynesian modes of economic activity challenged and also through the 1980s and 1990s increasingly experimental organisation of forms of governing that encompassed private interests and that by-passed established

governing structures. By the 1990s a new urban politics that promoted an entrepreneurial and managerial role for city governing had become visible and this rested on a view of the city as outward facing in terms of attracting investment and tourism and also in terms of a basis for comparison of urban success vis-à-vis other cities. This managerialism in urban economies was fused with debates around green cities. The threefold city relationships, encouraged through Agenda 21, with global institutions and national governments, internal capacities and partnerships, and horizontal networks combined to produce different degrees of capability to act in urban settings. In an era of economic liberalism and globalization cities were frequently being exhorted to be entrepreneurial, to position themselves to attract inward investment and, in organising economic activity in this way the management of environmental protection and social justice became caught up in particular searches for sustainability fixes (While et al, 2004). Urban boosterism and the search for growth incorporated environmental and social justice concerns as part of a process of constituting an externally facing place-based identity. This ongoing process of urban management was built on league tables, performance metrics and the perceptions of others.

Arguably recent decades have seen experimentation with multi-level governance both producing of and re-produced by an emerging green cities debate. The 'top-down', consensual, compartmental separation of elements of the sustainability debate, with a privileging of economic interests and relatively narrow forms of participation means that 'local action' often has a dependency on multi-level governance for resources and other forms of capability to act. This is critical in the framing and defining of what problems are and how responses are conceived. From this there has been an institutionalisation of a particular view of 'sustainability' that has elicited some variety of urban responses but within the bounds of those particular parameters. Yet the effects of this in terms of sustainability have been limited. This has been produced by architectures of governing at a distance that involve complex networks where decision-making is not constituted through struggle but through the redistribution of power to selective agents usually of business. In the balance between transformation and the status quo the advantage lies with the latter. The result being that 'into the new millennium, enthusiasm seems to have waned and hopes faded. It is already common to find academic commentators and dispirited professionals bemoaning the meagre results of years of urban environmental management' (Brand with Thomas, 2005, p.2).

2.3 Intensifying, Squeezing or Transforming Green Cities

Moving into the 2000s green cities were then confronted by a wide range of additional economic and ecological issues that began to question the existing assumptions and basis of the existing debates. Critical accounts of sustainable cities' debates highlighted the rhetorical power of the term and the view that 'it is constructed around a loose assemblage of problems, analytic fields and data (on resources, energy flows, production and consumption patterns, waste and pollution, lifestyles, and so on) which purport to demonstrate that the present organisation of cities is not sustainable *but can be made so* if the correct measures are taken' (Brand, 2007, pp.623-4 original emphasis).

Yet, as we have discussed above this is built on a view of economic growth underpinning the management of urban environments and social concerns. But what happens when there is limited or no growth? Much of the economic and financial basis underpinning the multi-level governance and institutionalisation of green cities was built on a model of global economic organisation that had liberal financial flows with unsustainable relationships of lending and debt at its core. What this has meant in policy terms has been the pre-eminence of a form of austerity governance as response with a secondary

response of new forms of green stimulus measures as an alternative. Again, as with the 1970s, we are seeing debates that question the very sustainability of a growth-based economic paradigm (Jackson, 2009). Furthermore, austerity and its implications for 'good governance' and the role of cities are under-explored. The weakening of public spending power and the promotion of a cuts agenda opens up the possibilities for a new private sector involvement in urban governance. Yet it also creates a space for alternatives and local, voluntary and charity sector responses to be given oxygen.

We are in an era of multiple crises and what the multi-level governing of cities looks like over time is critical, as we have seen from the ways in which the contemporary green cities' agenda was constructed. Indeed through a cascading of targets and priorities within a multi-level governance framework one of the issues facing cities is how they respond to an agenda of carbon control (While 2011). Where there are international agreements around reduction of carbon dioxide emissions and other greenhouse gasses that have been differentially appropriated by national governments and cascaded further to cities and regions, what does this mean for green cities' debates? Is the organisation of economies and resource flows on the basis of growth and principles of efficiency or no or low growth and the principle of sufficiency (Princen, 2005)?

In times where crisis may have become normal what sorts of vulnerabilities face urban centres and how is resilience effectively built? Is there a role for wired-up so-called 'smart' cities as part of responses and for the organisation of secure enclaves or economic and ecological privilege or will technocratic responses give way to more experiential, situated and social understanding in urban design? There are significant issues of genuine - or otherwise - participation in decisions and their effects for cities and therefore processual and consequential aspects of social justice. Furthermore, those issues of social justice are both inter-urban and intra-urban in that there is a spatiality to crises and their consequences.

The key response to the crises of the 1970s was a rescaling of governing from national states in an international system towards a more multi-level governance system that had key roles for the 'global', a 're-emergent' city and the national state. The issue is to what extent are multi-level governance frameworks re-enforcing the dominant strand of green cities' debates of the last three decades or are possibilities for alternatives likely to flourish? This is an issue of governing and what forms of governing are possible and become visible. It may be that there are numerous forms of fundamentally different response ranging from intensified hyper-liberal development, to new forms of localisation or municipal pragmatism that recognises it is not possible to balance economic, environmental and social in all instances (Whitehead, 2012).

2.4 Implications for Green Cities

What these issues bring to the fore then is the wider potential for developing a MUF programme that could be developed around building a critical understanding of the latest period of green cities debates in a systematic and comparative manner. The types of questions that then emerge from this contemporary context that could shape the orientation of a MUF programme are two fold. First, are we seeing the intensification or the transformation of green cities debates? The issue here is whether responses are becoming even more focused on the economic dimensions of green priorities or is there instead a move to open up the agenda and consider wider priorities about the value of economic growth by re-prioritising ecological, social justice or quality of life issues. Second, is there a squeezing or narrowing of the green cities agenda? The issue here is are the range of social interests involved in shaping priorities exclusive or inclusive

coalitions and is there less focus on priorities linked with social justice and the social control of resources. In the next section we see how these wider issues are being translated into, and exemplified by, newly emerging green niches.

3. Green City Niches: Emerging Thematic Priorities?

The issue is then how do we find a way into programmatically and comparatively examining the emerging dynamics of the contemporary green cities agenda. This section of the paper is primarily concerned with understanding the 'state of play' of emerging research and/or policy 'niches' developing around the green cities agenda over the last decade. The purpose of this is three-fold:

1. To assess what responses, concepts and priorities are exemplified in green cities thinking. In particular we are interested in which niches are either transforming or reintensifying the green cities debate that was represented through Agenda 21.
2. To review how each of these niches is seeking to reshape cities. In particular we are interested in understanding how they seek to reconfigure infrastructure and resource flows according to what priorities.
3. To identify the key research and policy challenges raised by each niche and the potential these may have for informing a distinctive MUF.

3.1 Urban Resilience

The resilience 'turn' almost appears to have displaced the sustainability discourse in its dominance in research and policy thinking about the environmental dimensions of cities (Davoudi 2012). Increasingly resilience appears to be mainstream within urban policy with practitioners implementing resilience strategies and policies in fields as diverse as climate change, flooding, energy infrastructure and logistics. Central to this shift is the way in which urban responses can apparently play a critical role in helping cities deal with systemic vulnerabilities and to resist or adapt to disruptive changes. The UNISDR (2012) example recently launched a new guide and global campaign with the objective of "Making Cities resilient: my city is getting ready!" A number of key actions are seen as central in preparing for and reducing urban risk these include: building institutional capacity, identifying and monitoring risks, building a culture of resilience, reducing risk factors and strengthening disaster preparedness.

Such guidance is becoming more commonplace as cities are asked to take the challenge of resilience seriously and commit to strategic plans to reduce vulnerability. For example, the EEA project report Urban adaptation to climate change in Europe warned that predicted climate scenarios presented a number of threats, including flooding, economic disruption and a range of public health issues (EEA 2012). Such threats also risked undermining urban infrastructures like energy, waste and transport that are essential for the day-to-day functioning of cities. The recent book collection Resilient Cities (Newman et al 2009) highlighted seven modifications that were linked to the design and use of new technologies in existing infrastructures that could potentially enhance resilience. These included: enhancing renewable energy technologies, increasing carbon neutral design, adopting increasingly localised instead of large centralised infrastructure systems, improving green infrastructures and spaces, developing a system where energy and material increasingly come from renewable sources, supporting place-based solutions, committing to sustainable transport particularly electrified vehicles, cycling and walkable cities. Although such a systemic transition was seen as desirable, a series of issues – not least financial constraints especially in the austerity era – were seen as barriers to the realization of such a vision (see ICLEI 2012).

The increasingly accepted use of the term resilience and its application to a wider range of urban policy areas is raising questions about whether resilience has become a 'catchall' phrase that has been applied to a whole series of different issues that the term has become so universal that it is loses any meaning. More recent work within the social sciences has started to look critically at what might be useful from resilience thinking and how we might turn it into a critical research and policy agenda (see Byrne et al 2009, Davoudi 2012). Three sets of ideas from this are helpful in thinking about how a resilience agenda could be constituted.

The first regards the limits of narrow engineering or ecological conceptions of resilience that are primarily focused on the ability of a system to return back to 'normal' after a disturbance or the magnitude of the disturbance that can be absorbed before the system changes. Much of the resilience debate is predominantly about a normative desire for a return to normal without ever questioning 'what' normal means. This is where resilience is often seen through a disaster management or emergency planning rather than long-term transformation in a socio-technical infrastructure.

Second, in contrast 'evolutionary resilience' challenges the idea of normal and argues that the nature of the system may itself change over time. In this view point resilience is not conceived as a return to normality but rather the ability of complex systems to change, adapt and transform in responses to stresses and strains. These may not necessarily be large-scale threats that are external but can be due to more internal stresses where small-scale changes are amplified and cascade into major shifts. This alternative approach potentially seems to offer a way of thinking about reconfigured infrastructural or green futures in which the parameters of a transformed future are open to debate and dialogue.

Third, even with this enlarged notion of resilience and system changes there are then a number of issues that flow from the application of a concept developed the natural sciences into social sciences. The main challenges of translating resilience from ecology to urban studies are to do with politics and power and the critical questions of what are the desired outcomes and resilience for whom. The issue is that in the ecological literature resilience is treated in an apolitical and power-blind manner. But the problem is that considering ecological issues and conflicts in a social context may mean that building resilience for some social interests and places means losses for others. This then raises a wider set of issues about how social action is conceived in resilience thinking. For example, the issue of 'self-organisation' has been reinterpreted as self-reliance that sees communities taking responsibility for producing resilience as a justification for the withdrawal of responsibilities by the national state. There is the wider issue of what is resilience for? In the ecological literature this refers to sustainability – but this is defined uncritically and the question is what type of sustainability. Finally, there is the question of defining a systems boundary in particular what is the resiliency of the eco-system of what to what? Is it about bounded divisible resilience or some wider collective view – in a bounded approach this may lead to exclusionary practices?

In summary there are clearly different uses of the term resilience and increasing research and policy interest in the issue. While there are clearly benefits in thinking through the interrelationships between social and ecological systems there would be value in develop a more critical and comparative analysis of the resilience turn and an opportunity for MUF to develop a potentially comparative agenda.

3.2 Urban Flows and Decoupling

There has been increasing research and policy interests in the relationship between population growth, increasing rates of urbanisation and the consequences for resource consumption particularly through infrastructure systems – energy, water and waste (Krausmann et al 2009, UNEP 2011). While Material Flow Analysis (MFA) has been traditionally applied to sectors, nation states and the global economy there has been over the last five years increasing efforts to focus on the analysis and modelling of urban metabolic flows, to explore the potential for decoupling resource use from economic growth and to examine these potentials in cities of the global north and south. This increasing attention on metabolic flows is of interest to MUF partly for its role in generating a research method and knowledge base on resource use that could be used comparatively but also for thinking through what might be missing in relation to institutional organisation of infrastructure and existing trajectories of resource flows.

Global consumption of resources is heavily concentrated in cities. For instance in 2005 the global economy consumed 60 billion tons of resources and 500 Exajoules of energy with almost 75% of these flows consumed in cities (UNEP 2011). Second wave urbanisation and the construction boom that will follow are expected to have a major impact on resource consumption. Given that many of the energy and resource flows that cities depend on are finite, it follows that the continuation of global economic growth will depend on the decoupling of this economic growth from escalating resource use. The systematic application of MFA from an industrial ecology perspective to the city-region has started to generate some sophisticated frameworks for grasping the complex empirical dynamics of resources flows through cities (for recent examples see Barles 2010).

MFA applied to city-regions makes it possible to identify and distinguish between the resource flows that get sourced from within and beyond the city, then get conducted through the city with some ending up as net addition to stocks and then moving into or beyond the city as wastes, goods and services. It is, of course, urban infrastructures that primarily conduct these flows. Although these applications are relatively new a review of applications (Weisz & Steinberger 2010) has shown that these methods can help in illustrating the very different levels of resource flows between cities, the ways in which decoupling means different things for cities at different stages of development and the critical role of rising household income (rather than urbanisation per se) in driving up resource use. The most significant outcome of the application of MFA to the city-region is that it facilitates the re-embedding of urban systems within the wider nexus of ecological services (e.g. water supplies, soils, air quality, landfill space) and natural resource extraction (such as, for example, fossil fuels or building materials that can be drawn from multiple sources).

While there is some evidence to indicate that relative decoupling is taking place (mainly in developed country cities), absolute resource reduction is unlikely to happen without deliberate intervention to stimulate broad, systemic (including behavioural) changes. A combination of three main techniques can allow cities to better manage the flows passing through them in pursuit of decoupling - here we illustrate with urban infrastructural examples:

Resource productivity improvements:

- Demand management and reduction methods in energy, water and transport;
- Retrofitting buildings and infrastructures to reduce losses and inefficiencies;
- Developing alternative infrastructure – cycling and walking as alternatives.

Increased use of local renewable resources:

- Positive energy houses that generate renewable energy and contribute to the grid;
- Enclosed water cycles and grey-water recycling to build more self-reliant infrastructures;
- Incorporation of renewable energy resources onto urban energy networks.

Re-use of waste products:

- Development of closed loop and circular metabolism through biomass municipal wastes etc.

More efficient usage of limited resources, improved management of renewable resources and the re-use of wastes are becoming the focus of initiatives that aspire to ensure the decoupling of rates of resource use from economic growth. For whole-system efficiencies to be realised at the city scale, strategic coalitions with a shared vision for decoupling will need to be developed with a multiplicity of stakeholders.

However, the role of cities in shaping systemic changes in the organisation of infrastructure and the level of resource flows is not well understood or researched in an interdisciplinary and comparative manner. In particular, there is a powerful disconnect between studies of urban resource flows using MFA and the social organisation and urban dynamics of resource flows. MUF could bring these two sets of issues together in a more comparative and systematic manner to understand existing material flow and infrastructure systems, the degree of flexibility and autonomy in developing new configurations and the limits and opportunities involved in up-scaling and accelerating decoupling.

3.3 Carbon Regulation and Urban Low Carbon Transitions

Another emerging niche over the last decade has been the emergence of a policy and research debate around carbon regulation and the implications for urban low carbon transitions within infrastructures and resources flows (While 2011). What is particularly distinctive about this niche is the targeting of carbon control as the critical ecological resource that is focused upon but also the systemic implications for the full range of urban infrastructures – energy, transport waste etc that have largely been based on carbon based energy. There are fundamental questions raised by this emerging niche in how cities effectively manage long-term changes in the social and technical organisation of obdurate and long-standing institutions, practices and infrastructures.

The construction of carbon regulation needs to be understood through a set of top-down processes designed to develop carbon reduction priorities. Post-Kyoto targets and quotas have cascaded down from the global level to national contexts, then in some contexts on to sub-national scales, including cities and city-regions (While *et al.,* 2010; Bulkeley and Betsill, 2003). This represents a significant shift from conventional sustainability concerns to the politics of carbon management at different scales. Carbon is increasingly seen as a currency, with value being attached through market-based instruments such as cap-and-trade schemes. Thus, when emissions are embodied in targets and quotas and value is attached to carbon emissions monitoring becomes central. What becomes important is the construction of carbon regulation through a set of criteria (targets, quotas, policies, technologies, behaviours, etc.) in relation to the city, the construction of methodologies to monitor emissions sources, and the political and policy strategies of response. In particular, how production and consumption is

organised and how these relationships are reconfigured and mediated. That includes the configuration of social interests, technologies and techniques that define the present as problematic but also structure the logic of possible responses.

At an urban scale political struggles are also likely to be over investment, but also over regulatory/control choices and the renewed engagement of citizens in governance strategies (While *et al.,* 2010). More specifically this is likely to mean national disciplinary pressures for effective sub-national carbon management. This will be through combinations (that differ in contexts) of investment in low carbon infrastructure, efforts to shape low carbon firms and consumers, emissions targets from the national level that are at least matched and sometimes superseded by cities and regions, and the incorporation of these low carbon responses in local economic development strategies, as part of a wider global urban network of buying, selling and offsetting carbon credits. The use of targets at a national scale is one of seeking to mobilise state power to use carbon targets and quotas to discipline sub-national action.

There is, however, a large gap between such symbolic representations of a low carbon future and accompanying broad-brush efforts to achieve change and the material manifestations of the low carbon transition in particular places. In no small part this disconnect arises because of the need for effective capacity and capability to act at the urban level in order to undertake the systemic change necessary to achieve the fundamental transitions that such plans and strategies articulate. The transitions required to meet ambitious targets cannot be achieved by simple technical fixes or low-level changes in behaviour. What is required is a fundamental transformation of socio-technical infrastructure systems – including 'new' forms of energy technology, but also new regulatory frameworks, patterns of consumption, governance frameworks, spatial organisation and so on – which draw a large web of actors, artefacts and interests into a complex web. As a result, urban capacity and capability to act cannot be regarded in purely institutional terms, but are determined through particular political economies and socio-technical networks, that cross multiple scales (Bulkeley et al 2011).

In summary much of the contemporary discussion about low carbon transitions is focused on 'how' this is to be done with 'why and for whose' benefit left largely unproblematised. Bringing the 'why', 'how' and 'with what consequences' together means understanding the politics not only of 'implementation' or the translation of low carbon futures, but also the political production of visions and strategies. MUF could develop a distinctive comparative agenda that seeks to bring a more critical set of questions about the consequences of carbon regulation and the alternatives that could potentially be developed to address the limitations of the dominant techno-economic logic that is emerging.

3.4 More Growth, Green Growth or Beyond Growth for Cities

Under conditions of austerity important questions are being asked about the relationship between cities and different forms of growth. In the search for a response to economic crisis and ecological challenges different social interests are looking at the potential of green growth as an economic stimulus and a way of addressing ecological challenges (Raco and Flint 2012). These concerns overlap with wider urban concerns about the potential to link existing economic capacities with ecological priorities, the potential for innovation and job creation, the development of local economic specialities and the wider potential of first mover status in the development of and application of ecological technologies and infrastructures. These potentials have been picked up and promoted by international development agencies and cities in both the global north and

south such as the OECD and UN-Habitat. Yet there has been very little comparative work looking across this niche and its implications. There are three different dimensions to this niche.

The first is whether the objective of policy is to simply stimulate more economic growth. This view is one that is essentially a reassertion of faith in the organisation of economic activity that was exemplified from the 1980s, through the 1990s and into the 2000s. In this view the confluence of crises from 2007 onwards created the context for the application of more shock therapy (Klein, 2007), whereby these crises provided the context for the creation of new market opportunities, the liberalisation and privatisation of existing public assets, infrastructures and services, and the mobilisation of crisis governance to justify this. Prosperity is closely intertwined with material consumption and rising gross domestic product (GDP). Within this context the role of urban economic strategies are to create more opportunities for private provision in investment in infrastructure and or retrofitting activities.

The second option is slightly different. Practically, as a response to economic, financial and (to a lesser extent) ecological crises, green deal (or new deal) programmes have been laid out by national governments, including the UK and US government, as part of stimulus packages for national economies and as an option by international development agencies. The issue is what they are providing stimulus to (see Luke, 2008). Such programmes, first and foremost, are designed to stimulate economic activity, but to do so with some degree of intervention in existing carbon- based infrastructure systems – whether that is through domestic home insulation programmes, or incentives to implement community renewable technologies, to support the uptake of low carbon vehicles, and so on. Yet the extent to which this is likely to contribute to different forms of decoupling is extremely difficult to know given the amount of time over which future calculations will be made and the new inter-relationships across national borders that will result. So, for example, the promotion of the uptake of low carbon vehicles may have positive ecological consequences in terms of the substitution of biofuels for oil but it may also result in the growing of crops for fuel, contribution to increased food prices, the importation of feedstock's, the material consequences – positive and negative – of constructing new plug-in infrastructure, the ecological consequences of the mining of lithium for vehicle batteries, and so on. A key issue is to what extent reconfiguring infrastructure systems is for the purpose of producing a 'greener' form of economic growth that actually reinforces the desire for economic growth.

Finally, moving from the status quo to a radically new form of capitalism a further step is to think of alternatives that go beyond growth and envisage society organised around very different principles than those of economic growth (Jackson, 2009; Boyle and Simms, 2009). This view is not solely about questioning the links between growth and the consumption of resources, but also questioning that economic growth and GDP are inextricably coupled to prosperity. The problem of growth and resource use is not one to be reconfigured, but to be put to one side while a bigger question is asked: what kind of societal development is required, and for whom? This goes beyond seeing prosperity as bound up with GDP, material commodities, exchange value and market utility, and becomes the focus for the development of capabilities to act and engage (Sen, 2010) in decision-making in constituting democratic, participative responses to the type of development required. This necessitates a rethink of the economy – away from its consumer-focused, commodification of wide areas of cultural life – to question GDP-led measures of the value of growth and to incorporate questions of inequality and well being into societal development.

In summary modes of green growth can range from the largely symbolic green washing of existing modes of economic organisation, with limited implications for transformation of the relationship between economic activity and carbon production to the more fundamental reorganisation of modes of economic production, consumption and the mediation of these relationships, which seek to 'decouple' carbon and economic growth. There is as yet little comparative work looking at the interconnections between green cities and economic priorities. This clearly creates a potential opportunity for comparative work within MUF that takes a critical perspective on these tendencies in order to try to develop more clarity about their ecological implications and the potentials for alternatives.

3.5 Smart Urbanism: Smart Grids and Smart Cities

Smart urbanism is emerging as a potentially dominant concept in shaping new ideas about the relationships between infrastructures and cities in both cities of the global north and south (Holland 2008). But how this links to more conventional green agendas is not yet clear. Is this primarily a technical agenda about the operation of infrastructure networks or does it develop new capacities that can reshape ecological resource flows and facilitate the integration of low carbon technologies into established infrastructures?

Smart urbanism is based on the rebundling of the capabilities of ICTs, digital and software technologies that are selectively repackaged with different infrastructures and spaces at a range of different scales (Crang and Graham 2007). The first is primarily concerned with the future development of infrastructure grids that are viewed as requiring 'smart' systems - systems capable of real-time decision- making, learning, self-organization, and even self-healing. These new smart capabilities are expected to address the challenges of intensified demand, increasing short- and long-term uncertainty concerning power sources and network viability, and the increased complexity emerging from the sheer number of diverse and independently controlled devices operating within infrastructure networks. These changes mean that the infrastructure networks of the future will be technically, socially, environmentally and commercially more difficult to manage and design than those of today. Second, 'smart' is also increasingly applied to the urban context, to describe the attributes of single buildings, neighbourhoods and even whole cities that make use of new forms of digital communications, digital data, automation, and integrated utility services, on the one hand, and where principles of sustainability are used to minimize waste and provide energy/water services in a self-sufficient and low carbon manner, on the other. These two – but not necessarily related - sets of drivers are becoming increasingly intertwined in a new phenomena called smart urbanism.

Yet there appear to be quite different ways in which these capacities and capabilities are being rebundled with at least four styles of smart urbanism. The first is smart grid roll-out, where centralised control of infrastructure together with limited urban capacity leads to the domination of smart applications by incumbent utilities. The second is smart cities roll out where comprehensive technologies are matched by effective urban governance capacity that is able to produce city-led forms of smart. The third is off-grid, where decentralised architectures and autonomous control are coupled with devolved capacity to produce (potentially multiple) independent forms of smart in the city – smart houses, smart neighbourhoods etc. Finally *DIY,* where decentralised architectures and autonomous control systems are coupled with a lack of urban governance capacity

to create forms of grassroots innovation and civil-society led smart applications (Associated Press 2011). Examples of these different configurations can be found in cities of the global south and north.

The result is an emerging set of policies, programmes and practices that are intent on realizing different style of smart urbanism. This is visible in the importance of 'smart cities' in the EU Strategic Energy Technology Plan, the development of energy systems in Asia, Australia, China and the US, and the developmental priorities of the World Bank. Engineering, telecommunications and utilities companies such as IBM, Cisco, Toshiba, Google, General Electric, and Hitachi are developing new business opportunities in smart projects. Taken together, these new drivers and programmes are creating a new capacity through which the development of cities and infrastructure systems is being actively shaped. The critical question though is implications does it have for addressing environmental and climate change issues.

In summary while often radically different in ambition and scope, from single houses to the wholesale transformation of regional energy supply systems, the shift from a conventional to smart logic is accompanied by new expectations of network flexibility, demand responsiveness, green growth, new energy services, and connected communities. Yet, the potential and limitations of this transformation have not been critically examined in an interdisciplinary manner. Within the engineering and physical sciences, research has focused on the technical and economic dimensions of smart *systems* (Jamasb and Pollitt 2011) ignoring the social and urban issues associated with smart. But evidence from the analysis of previous interventions in urban systems, including the development of grid-based electricity (Hughes 1983, Nye 1999), suggests that cities play a critical role in the development of these transitions but they are inherently complex and contested - and often fail.

In summary, the development of an in-depth, critical and comparative understanding of smart urbanism will be a key challenge. There is the potential here for MUF to develop a unique internationally comparative and interdisciplinary research agenda in order to examine how and why smart varies across different urban contexts and how it might be shaped to deliver other green and community benefits.

3.6 Urban Securitisation

Economic, ecological and political pressures are placing increasing emphasis on the 'security' of infrastructure and resource flows at a range of different scales (Barry and Eckersley 2005, Meadowcroft 2005). Strategic national state interest in energy, water, and resource security are translating into efforts to understand the longer-term implications of climate change and resource scarcity at an urban scale. These pressures create the conditions under which cities and regions strategically attempt to secure the resources necessary for their ecological and material reproduction. But if there is a differential capacity and capability to develop strategic urban responses then consequence of this may be a selective privileging of particular urban areas and their ability to cope with climate change and resource constraint at the expense of other urban contexts.

A series of socio-economic and political problems posed by, for example, climate change such as the growth of new diseases, and constraints on water resources and questions around energy security are pushing issues of ecological security up the agenda of national governments (Davis 2010). The critical issue for national governments is the ability to ensure that they have secure and continued access to the resources needed to

ensure their economic and social reproduction. Questions about the security of ecological resources has become internalised and intertwined with national states' priorities and responsibilities for social welfare and economic competitiveness. Yet these are also increasingly becoming issues at an urban scale as the issue of how the economic and ecological well being of these cities can be secured in a context of rapidly growing population, demand for resources and resource constraints (water, energy, etc) and intense competition for economic activity and jobs under conditions of austerity.

Increasingly certain cities are developing a more strategic orientation towards questions about their future resource requirements (Hodson and Marvin 2009). Critical to this is the incorporation of resource endowments and the ability to overcome constraints in the economic and social competition between cities. What has shifted here is a move from the post-9/11 agenda of critical infrastructure protection from terrorism or the consequences of environmental damage to a position where the city can guarantee its material resource state against a background of resource constraint and competition. In a very real sense a new dimension of cities' competitive positioning is their ability to internalise, bound and control their resource endowment, supply, consumption and production. Cities are attempting to 'enclose' resources. But what strategies will places adopt as they seek to guarantee their material reproduction?

The strategic orientation to resource constraint is leading to the development of new styles of infrastructure development that privilege particular spatial and socio-technical configurations of infrastructure (Hodson and Marvin 2011). In a period of resource constraint and climate change the world's largest cities are beginning to translate their strategic concern about their ability to guarantee resources into strategies designed to reshape the city and its relations with resources and other spaces. Three responses are being developed in response to these pressures:

- Ensuring the strategic protection of cities from the impacts and effects of climate change and associated resource constraints.

- Building 'autarky' in the supply of water and energy, the mobility of people and goods, and disposal of wastes.

- Cities collectively build new global urban agglomerations of new infrastructural linkages that reinforce connectivity between world cities.

These responses contribute to the production of the secessionist securitisation of resource flows that are organised through language and concepts such as decarbonisation, neutrality, self-sufficiency and resilience at a range of different scales from the metropolitan area to individual buildings. This is reconfiguration according to economic priorities that recognise the need to secure 'clean' resource flows to fuel this economic activity. It is a form of mutual spatial and infrastructural reconfiguration underpinned by aims for relative decoupling through decentralised energy systems and rescaled waste systems. These are deeply shaped by pre-existing power relationships, assets and endowments – knowledge, technology, finance, and so on.

In summary securitised resource flows constitute a research and policy agenda that needs to be critically tested. There is the potential for a MUF comparative project that seeks to look over the set of infrastructures and resource flows in an urban context and how the securities niche is reshaping infrastructural priorities and whether this is building divisible or collective security.

3.7 Experimental Green Cities as Test-Beds

A key theme that potentially cuts across all the emerging niches discussed so far is the degree to which the myriad responses can be regarded as forms of green experimentation (Evans 2011, Bulkeley and Castan Broto 2012). The importance of this is three-fold. First, in response to the intensification of economic and ecological challenges the urban responses required have to address increasingly 'systemic' issues about the social and technical organisation of urban infrastructures. Second, within a context where urban public sector capacity to develop systemic responses has been increasingly limited by a combination of economic austerity, reductions in public expenditure and continued privatisation and liberalization of infrastructure more experimental responses have had to be developed in the absence of national and international agreements and urban capacity. Third, what characterises these responses in a particular urban context can be extremely diverse with multiple forms of experimentation that can include:

- Networked responses through organisations such as ICLEI, C40, and Transitions Towns.
- Localised and community responses - big society, squat tech, slum tech, cooperatives, and low budget urbanism.
- Private Corporate responses – ecocities, large corporate programmes such as those by Siemens and IBM.

These responses are likely to only be loosely connected to formal government international and national policy priorities. Through experiments we can see how cities, citizen groups, and corporations are seeking to address the causes and symptoms of global ecological change. This pushes the centre of gravity from multilateral treaty-making process to a more diverse set of activities. These innovations may be pushing the boundaries and limits of green cities and demonstrating what is possible.

Green experiments can then be considered as part of the broader phenomenon of climate governance experimentation documented by Hoffman (2011). But they may also refer to other forms of experimentation outlined in the niches above related to smart, resilience and decoupling etc. Consequently, there are three sets of issues particular to the urban context that need to be considered in any further analysis. First, these forms of experimentation need to be understood through the ways in which urban authority is being restructured and how the potential for strategic responses is structured through urban political economies (While et al. 2010). This means that an analysis of green experimentation would expect to find differences in the style of experimentation emerging in different kinds of cities, in different global regions, and where different urban dynamics – of growth, politics, social change and so on – are taking place. Second, critical insights from literatures on socio-technical systems and the role of niches and experiments in creating new spaces with the potential for transformative change are valuable in this regard, but still have to be systematically explored in the urban context (Bulkeley et al. 2011). Rather than creating protected spaces through which innovation can be fostered and system change developed, experiments could create controversy and conflict offering the basis for contested new styles of practice. Third, as the literatures on living laboratories suggest, urban experiments are conducted by a range of actors, and to various purposes (Evans 2011). This is not to suggest that experimentation may not form a critical part of the dynamics of urban transition, but it is to raise questions about how and with what effect climate change experiments are able to shape such trajectories and indeed about how we should conceive of the notion of transition itself.

In summary what we can see across all these different contexts are efforts by a diverse range of social interests – public, private and communities - to develop experimental responses to different pressures. MUF could develop a programme on green cities by engaging with experiments as a potentially vital site through which green city governing is conducted in order to undertake comparative analysis of their drivers, contexts and content and wider consequences for systemic urban change.

3.8 Research/Policy Challenges Emerging from the Niches

These niches raise three implications for MUF.

First, while we have tried to be as inclusive as possible and draw upon both the literature and our prior discussions within MUF about possible niches we accept that there could be additional niches that have local relevance. We will examine if there are additional niches in each LIP and whether these then have comparative relevance in a green cities programme.

Second, we have not assumed that all these niches are necessarily relevant in every urban context within MUF. We are confident from our prior discussions, input from the IPP and grey literature sources that many of the niches have relevance in each LIP context. The question for the next stage is how important are the different niches within and across the LIP contexts. It may be that particular niches or sets of niches emerge as being more important than others.

Third, we also recognise that a niche can be constituted in different ways within each LIP. There is likely to be diversity in the social visions informing niches, the social interests involved and those excluded, the capacities developed and the social and material consequences. Understanding this diversity comparatively and the implications for different contexts would be a central role of the green cities programme.

These three issues them inform the development of the box below that sets out for each niche a set of indicative challenges that are of research and policy relevance. This provides an initial outline of the framework of questions that could then inform the development of a comparative programme.

Potential Niche	Key Research and Policy Challenges
Urban Resilience	1. Why is resilience emerging as an issue in a particular urban context? Is this the result of international policy networks, applications through particular professional network such as emergency planning, or because of the research activities of a local university? What other policy priorities are it seen as displacing? Who are the critical social interests and conduits through which it emerges as a focus on activity and applied to what particular infrastructure networks? 2. What type of resilience is this about? Is this for instance the narrow notion of resilience with a view of return back to some notion of 'normal' or is about an evolutionary resilience with a wider notion of the possibilities of some form of transformation and change to better ecological conditions? For instance rather than more economic growth, is it about green growth or alternatives to growth? 3. How does and whom gets to decide what resilience is? What social and technical processes are utilised to develop resilience knowledge and intelligence, how it is implemented and who gets to decide on the process/content and exclusions and inclusions in the process? How does knowledge and networks shape investments and disinvestments in infrastructure and critical resources?
Urban Flows and Decoupling	1. How are cities material resource flow profiles and the social and technical structure of utilities and infrastructure organised? In particualr what are the pressures and drivers in individual cities what is existing or latent socio-technical capability to shape resource flows? *2.* What types of responses are being developed and what types of socio-material consequnces do these have? In particular what do these experiments tell us about the degree of obduracy within existing infrastructure regimes – how do existing social relations, institutions and regulations prevent or slow the up-scaling of initiatives and which changes are required to accelerate transitions? Do such strategies lead to relative or absolute decoupling? 3. How can we learn across different experiments within the same city (as well as comparatively) in terms of what second order social learning from experimentation can help inform the development of transformative capability?
Urban Carbon Regulation and Low Carbon Transitions	1. Why are visions organised the way they are, and whose views have been included and excluded? For instance are these visions about really about transformation in the socio-technical organisation of infrastructure or are they consistent with existing economic priorities and strategies? 2. How is capacity and capability to act constituted? For example to what extent coalitions of interest are narrowly constituted as capability has a wider significance politically and democratically, and it also asks questions as to how community and 'alternatives' connect to the dominant field of low carbon response. 3. What are the socio-material consequences of strategies? Are these spatially selective or cover the wider metropolitan area, do they build inequalities between and within cities? Are some places more able to regulate carbon than others?

New Deal, Green Growth or Beyond Growth for Cities	1. What sort of urban visions associated with different ideas about growth – more, green alternatives? How are these produced and by which social interests and with what exclusions? 2. How are capacities are being developed to reshape growth? Are these conventional economic development responses or are they more transformational? What are the critical priorities, growth innovation or jobs? 3. What are the consequences of such strategies? What sorts of growth emerge and what are the ecological consequences? Does this relate to processes of more systemic change in existing infrastructures?
Smart Urbanism: Smart Grids and Smart Cities	1. How to develop the social and technical frameworks necessary for interdisciplinary analysis of smart urbanism? Developing a programmatic response would require building understanding of the technical aspects of smart technologies in order to analyze the interconnections between technical design options and the styles of smart urbanism being produced. 2. What are the dynamics of smart being developed in different urban contexts and what wider consequences do these have for the city? Smart urbanism may serve to further deepen the splintering of urban networks that dominated the last part of the twentieth century for many cities, creating deep divides between those with access to 'smart' and those without. Alternatively, in some guises, smart may serve to promote more 'community' or 'municipal' forms of energy provision and urban life. 3. How can the potential of DIY or alternative community smart pathways being developed be understood and developed? How do these compare with the more dominant incumbent led systems developed by cities and existing utilities and technology providers.
Urban Securitisation	1. Why and what security questions are shaping local debates about the development of infrastructure? What is the relative importance of economic, political and ecological concepts of securitisation? How are risks and vulnerabilities understood and according to which threats and pressures? 2. Who benefits by these configurations, what social interests are missing or disadvantaged and what material consequences does this produce? Are we now talking about new forms of autarky based on withdrawal from and bypassing of national and regional infrastructure and new archipelagos of connected world cities? What does this means for the by-passed places, the new peripheries constructed by enclosure and the ordinary cities of the north and global cities of the south? 3. What are the alternatives and where do we look for other forms of innovation driven by missing social interests and objectives populated by alternative notions of fair shares, collective security, equality of access?
Experimental Green Cities as Test Beds	1. What are the different kinds of experimentation that are emerging in urban contexts, how are these structured through existing political economies and institutional capacities, and whose interests are served through these processes? 2. How, why and with what effect experiments take shape within specific urban context? For example what are the specific mechanisms whereby an experiment is produced, which options and social interests are included and excluded, and with what consequence? 3. What are the implications and consequences of experimentation? Such research might consider the effectiveness of experiments - their role in achieving green and other urban goals - the reconfiguration of urban socio-technical systems and whether they may lead to broader processes of transition and change in the city.

4. Key Questions and Options for MUF

In this section we identify the three generic issues arising from contemporary green cities debates, identify the 5 specific questions for the LIPs and outline a set of options for the content and organisation of a research programme. All of these are initial proposals to stimulate for feedback from, and further discussion with, the LIP directors.

4.1 Reshaping Green Cities Debate

It clear that there are potentially important changes taking place in green cities debate especially in relation to socio-technical infrastructures and urban resource flows. There are three core issues emerging from sections 2 and 3 of the paper:

1. That there is evidence of increasing emphasis in urban responses upon the economic, technological, climate and security dimensions of green cities since 2000 and especially as a consequence of the crises since 2007. The issue is whether this has seen less focus placed on questions of social equity, social control of resources and infrastructure, and other less strategically orientated aspects of urban ecology.
2. The critical issue for cities becomes focused around how in a period of economic austerity and global ecological change they are able to develop the capacity and knowledge to ensure continued access to infrastructure and resource flows to ensure urban reproduction. The issue is how is this capacity developed and are there differences between different cities ability to capture comparative advantage.
3. Given the narrowing of the green cities agenda the critical challenge then is to explore ways of widening the agenda of issues discussed, opening up the debate to a more inclusive set of social interests and developing responses that seek to build collective rather than bounded security.

4.2 Green Cities in the 21st Century – Core Questions

There is a critical need to examine these three generic issues in a systemic and comparative way across the different urban contexts. This then raises 5 sets of issues for the LIPs:

1. Relevance of Emerging Niches: What is the relevance of these niches in different urban contexts? Is there evidence of these niches emerging in the local context and if so which ones and why? Is the urban context a receiver of these niches as external priorities or are there cities able to develop their own view of green futures?
2. Relationship between Economy and Ecology: How is the balance between economy and ecology understood in the urban context? To what extent do green visions prioritise economic over ecological priorities or vice versa? Or are fundamentally rethought views of that relationship illustrated? Is, for example, GDP mobilised as a primary justification for low carbon futures? Are security of resource flows and growth dominant features of visions?
3. Urban Infrastructure and Resource Transition: What is the relationship between city or region and forms of infrastructure represented? Is there a dominance of new forms of infrastructure or an adaptation of existing systems? Is this view city or region-wide or does it prioritise specific areas

and neglect others? What is the balance between technological responses and behavioural change?

4. Constituting the Capacity to Act: How is capacity and capability mobilised to develop green futures? Who is involved and who is excluded from these processes? And are existing institutional frameworks developed or are specialist intermediaries being created?
5. Implications - Transformation or Continuity: What is the longer term and systemic implications of these forms of experimentation? Is there learning from niches and experiments and how does such knowledge reshape priorities and investment? What are the socio-material consequences of strategies, do they seek to transform networks or strengthen existing relationships? Do they build bounded or collective planetary security?

4.3 Content and Organisation

The critical challenge for MUF is to develop a collective orientation for the design of comparative project that address two issues.

The first is the content of the research – "what" is the empirical focus of the programme? There are three potential options:

1. Specific – focus on one or more niches.
2. Generic – focus on a much more general theme such as experimentalism that could then draw upon different examples from the local context.
3. Hybrid – blend the two approaches above choosing a general theme like experimentation but having a more prescribed list of three niches to draw from as exemplars.

The second is the organisation of the programme – "how" is the programme of work delivered? There are three potential options:

1. Devolved – in this option the LIPs undertakes the delivery of the programme within a loosely prescribed framework by UFArena.
2. Centralised – in this option the UFArena develops a tightly prescribed framework and programme that is then undertaken by the LIPs.
3. Hybrid – this would combine different styles of working over the course of the programme. The LIPs and UFArena would adopt different roles in each phase of the programme ensuring sufficient flexibility for local work with strong coordination to ensure comparative rigour.

The above issues are for further discussion with the LIPs and within the UFArena.

5. Next Steps

In this section we set out the key questions and issues we would like to explore with the LIPs, the process for doing this and the potential understanding that we will produce.

5.1 Questions and Issues to explore with the LIP directors

The purpose of the paper is to start the process of developing a focused MUF research agenda on green cities. It would be helpful to have feedback on from the LIP directors in the ***form of a three-page note*** based on a response to:

a. ***Response to three implications outlined in 4.1 (half page)***

   Are these broad issues reflected strong in your own assessment of green cities debate in your own context? Is there anything that strikes you as important to mention in your response that is either missing from these issues and or is particularly significant in the local context?

b. ***Response to research priorities 1 and 2 outlined in section 4.2 (one and a half pages)***

   We want to try to build some understanding of the potential relevance and relative importance of the emerging green niches in your own context. From you understanding of the contexts could you please provide some sense of which are evident/most dominant, which are weak/emerging and which are missing from the local context. Please focus on questions 1 and 2. We will pick up the relevance of the other questions in our telephone discussion.

c. ***Response to research programme outlined in section 4.3 (one page)***

   Could you please comment on your own preferences for the balance between specificity/generality in the research focus and the relative balance between devolved/centralised LIP - UFAreana roles in the organisation of the research programme.

5.2 The Three-Step Process

1. LIP Responses - Each LIP director – responds to the questions by producing a three page note. This is then sent to SM in the UFArena by February 22nd 2013.
2. UFArena - LIP Telephone Discussion - SM will then read all the responses and construct an overview of issues and options. SM will then have a telephone discussion with each LIP Director to discuss relevant issues associated with each LIP response and to look at the cross cutting issues that are emerging. Week of February 25th 2013.
3. UF Arena Synthesis – SM will prepare a short report on the responses seeking to identify the resonances and dissonances between LIP perspectives and a set of options for the content and organisation of a comparative green cities programme. This will be presented at the Cape Town meeting and we will have an hour discussion. The outcome of this discussion will be incorporated into a synthesis for the UFArena. Week of 11th March 2012

5.3 Outcomes from the Process

1. An overview of the green cities debate identifying the potential for a MUF programme.
2. An initial orientation from the LIPs (to be further developed) of the critical green cities issues and niches within each local context, the relevance of the questions raised in the paper and what is missing or needs to be included.
3. An initial draft of a shared orientation focused around the identification of one or two options for taking forward the agenda collectively in terms of why, what and how it might be organised.

END

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