

Birmingham: the UK's First Biophilic City

Abstract

Birmingham is the first city in the UK to be invited to join the new global Biophilic Cities Network on the strength of its environmental research and evidence-based policy. This paper is based on a review of the existing research and evidence that have informed recent policy adopted by Birmingham City Council. The policy has been deliberately drawn across disciplines and highlights the multiple benefits of urban green infrastructure and urban forestry. Birmingham has set a political goal to become one of the leading green cities in the world. This goes far deeper than trees. However, this does not mean that trees can remain marginalised or even outsourced. Fortunately, the power of the evidence amassed from the research has changed the mind-sets of key decision-makers. The Green Vision document for the city commits it to adopting an ecosystem services approach and moving towards being a natural capital city.

Instead of being marginalised, trees are now central to many debates. This has not been achieved by focusing on the trees; it has been achieved by highlighting the scale of the risks and challenges the whole city faces, to which trees are then identified as one of the solutions. Members of the Biophilic Cities Network define themselves as cities committed to putting nature at the heart of their decision-making. This is a huge challenge, particularly amid a global recession. If Birmingham is serious about its global green credentials, it must now benchmark itself against these new global partner cities.

Introduction

Birmingham was formally invited in October 2013 to join the new global Biophilic Cities Network. This was the culmination of the journey taken by Birmingham City Council over the past few years, which is summarised here in this paper.

Cities around the world are facing very significant challenges in the 21st century. It is vital to gain a better understanding of this revised context in which cities find themselves in order to re-think the approach to their future management and operations. Many existing institutional structures and arrangements, including the priorities for budgets, date back to the 19th or first half of the 20th century. They do not meet the requirements of 21st-century cities today. There is an urgent need to bring about systematic change in the way we do things in cities. The 19th and 20th centuries provided no mechanisms for calculating the impact of urban living on the natural environment. With planetary limits now at their thresholds, and in some areas already crossed, this absence cannot be allowed to continue into the 21st century. This is the tale of one city – not two!

The Global Context

The Millennium Ecosystem Assessment, commenced in 2000 and completed and published in 2005, effectively introduced a whole new area of science to the world (Watson and Zakri, 2005). It provided a starting point for the human race to recognise its total dependency on the natural world. The scale of that dependency and the vulnerability of the earth's natural habitat to continue to provide for man's needs were brought into sharp focus. Suddenly, the consequences of our

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collective lifestyles and economy were exposed as being unsustainable. Something needed to change and change quickly to avoid imminent collapse in certain quarters. The response from the accountancy fraternity (Bonner *et al.*, 2012) was the creation of a new way of calculating financial risk and understanding co-dependencies, known as Natural Capital Economics (Sukhdev, 2010a and 2010b).

Within a year of this ground-breaking work the world was reeling from another monumental study, *The Stern Review on the Economics of Climate Change* (Stern, 2007). This study set out to establish the economic cost to the world of the impact of climate change. The report's conclusion and headline was that 1% of global gross domestic product (GDP) would be required to be invested annually in order to continually rectify this impact. That figure was only a best guess and based on the notion that the world would have to agree collective action and start responding immediately. What we now know is that a collective global agreement has not proved workable, and so much of that investment has yet to even start. So, when interviewed at the World Economic Forum in Davos in 2013, Lord Stern observed that his was a considerable underestimate. If he were to be undertaking the work now, with all that has since emerged from further global studies, his estimate would be much higher, possibly as high as 2-3% of annual global GDP.

These global studies emerge as compendiums, so thick that few people are likely to read them. What has often been missed in *The Stern Review* are some very useful and practical pointers as to what should be done by countries or by cities, as it contains considerable advice and guidance. There is a strong recommendation to form new partnerships between the public and private sectors; to work with civil society and with individuals. In addition, it advocates that land-use planning and adaptation action be integrated into development policy and planning at every level, supported by accurate evidence for every location.

The UK Context

Within the UK, this advice was drawn into the Local Government Agreement National Indicator number 188: Adapting to Climate Change (2009-11). This was highly unusual, as it is a process measure – not a fixed target – that recommends that cities build

an evidence base, partnerships and a joined-up action plan. The Adaptation Plan for Birmingham was awarded the 2010 UK Local Area Research and Intelligence Association (LARIA) Award for its broad partnership approach embedded in new innovative city-specific research.

Birmingham's Climate Model

With the help of external funding, the city was able to follow the advice from Stern and commission a climate impact model specifically for Birmingham through the University of Birmingham. The project was code-named BUCCANEER (Birmingham Urban Climate Change Adaptation with Neighbourhood Estimates of Environmental Risk), and generated the first comprehensive climate model for any UK city (Tomlinson *et al.*, 2012). It identified and mapped the urban heat island effect whereby under extended heat wave conditions the built environment retains its heat load, building an island of heat at night that is concentrated where the city is at its densest. This effect can create dramatic differences between city centre locations and outer margins or green belt areas: the night time temperature difference can be as great as 8°C. These excessive night time temperatures are recognised to have significant implications for public health, leading to excessive hospital admissions or even premature deaths among the most vulnerable.

The BUCCANEER project went much further than just studying the impact of urban heat; it also investigated the overlaps between 11 environmental, social and economic factors affecting the city and its citizens. This enabled the model not only to be able to use the UK Climate Impact Project scenarios through to the year 2100, but also to highlight where in the city – and who in the city – would be at greatest risk. The model also enabled the introduction of 'virtual' urban greening to test the local effects on temperature. The interactive and interconnected aspects of this model were sufficient for it to become the national winner of the 2012 Lord Stafford Award for Environmental Innovation and Sustainability. The Birmingham Urban Climate Laboratory website, hosted by the University of Birmingham, carries all of this research (Bassett, 2010).

The BUCCANEER project established a new baseline for the impact of climate change on the city. The University of Birmingham has been able to successfully

secure a further £1 million in additional research funding to develop the densest array of automatic temperature sensors of any city in the world, which will help correlate the impact of high temperatures on electricity and rail infrastructure (Dobney *et al.*, 2010). This will establish in much more detail exactly how increased temperatures are affecting citizens' health and hospital admissions.

In 2013, the University of Birmingham was successful in funding a PhD study for BUCCANEER 2, re-validating the climate model based on real-time data coupled with wind direction and wind speed measurements, ambulance movements and service planning, and identifying the local neighbourhoods presenting public health risks. The position and effect of trees and urban forestry will be incorporated into any new models or simulations. The final publication date is anticipated to be 2016.

Birmingham has the status of a Peer City across the European Union (EU) in relation to climate change adaptation. The city recently completed a programme of work under the EU Cities Adapt programme 2013-14, supervised through ICLEI – Europe, Local Governments for Sustainability. The city is also taking a lead in the EU Mayors Adapt Initiative in 2014. The importance of urban forestry within the suite of actions that cities can take to adapt to climate change is internationally recognised and increasingly studied, in areas ranging from flood risk and stormwater controls, the urban heat island effect and its reduction and air quality improvements, to health and well-being contributions.

Health as a Major Driver for Cities

Population health has become a major concern for cities around the world, including the UK. Birmingham sadly tops the UK league tables for childhood asthma and childhood obesity, with an alarming 40% of 10 year olds being clinically obese. In terms of global research, a study undertaken in 2007 by Manoli *et al.* (2007) provided a medical breakthrough, the implications of which are still having a global impact. This research for the first time established the medical cause of five non-communicable diseases – cancers, cardiovascular disease, dementia, diabetes and depression – as being 'stress'. In 2011, the Secretary General of the United Nations, Ban Ki-moon, identified these non-communicable diseases as the number one health

threat facing the world, pointing out that it is in cities where these are most keenly felt (Ki-moon, 2011).

These health effects are not so surprising considering the human evolutionary timeline. We have been operating as upright, walking *Homo sapiens* for at least the past 100,000 years, so genetically we have evolved to cope with and respond to the natural environment. We have only been living in cities for approximately the past 200 years, which means that genetically we are not designed or equipped to cope with city living. These medical findings have profound implications for spatial planning and the design of the built environment, and additionally for future preventative health care.

Birmingham's Matrix Management Approach

The approach taken in Birmingham to addressing many of these issues and concerns has been to change the way in which different stakeholders work together. This has been dubbed 'a 9-piece jigsaw', whereby nine stakeholder groups across nine disciplines covering the themes of climate science, flood and water management, business, city resilience and community, biodiversity, planning, transportation and infrastructure, public health and parks and green spaces, were brought together for the first time. The group is called the Green Infrastructure and Adaptation Delivery Group and now reports to the city's Green Commission (McKay, 2012). The members of the group began by sharing their respective evidence sets. Instant synergies were spotted, and what also emerged were gaps in our collective knowledge. The next step was to try to align all areas of policy, again looking for synergies and any significant gaps. The final part of this group's activities was to get on to the 'delivery' element of the title, so a matrix management delivery plan was drafted over a ten-year timeframe and fed into the Infrastructure Delivery Plan in the Planning Framework. This will direct the spending of all funds raised through the Community Infrastructure Levy from all development, citywide.

As part of this approach, two significant gaps in evidence and city policy were identified. The first was the need for a green infrastructure strategy for the city, and the second was the need to undertake an ecosystems services assessment that would match the scientific criteria of the UK government's report published in 2011 (UK NEA, 2011).

UK Government Legislation Changes

When the current UK government came to power in 2010, it set about reforming large swathes of relevant legislation, which had direct implications for UK cities, including Birmingham. The government worked on legislation to divide the Health Service in two between clinical health care, delivered through hospitals and GP practices, and public health services, which were to be returned to local authority control from April 2013. There was substantial reform of the nation's planning legislation, taking what amounted to over 1,000 pages of legislation and reducing them to a new National Planning Policy Framework of just 60 pages in length. The government introduced a Natural Environment White Paper (Defra, 2011) and undertook a national ecosystem assessment, becoming the first country in the world to do so. It also established an independent advisory group called the Natural Capital Committee to advise the Chancellor of the Exchequer, via the Economics Affairs Committee, on how future economic growth could be achieved within natural capital limits. The final area of reform was to introduce a climate change risk assessment process and national adaptation plan.

At the time, Birmingham's emerging green infrastructure strategy was able to absorb and reflect all these government changes and respond to the internal city process devised through the '9-piece jigsaw' approach. This introduced to the city seven new key principles that are cross-cutting in nature and help to deliver change, through the spatial planning process, across diverse policy areas. The Birmingham Green Living Spaces Plan was formally adopted in September 2013 (BCC, 2013).

An Ecosystem Services Approach

Birmingham City Council was able to get external funding support from government agencies to help it undertake the ecosystem services assessment of the city's green and blue infrastructure. Birmingham was the first UK city to complete this at a whole city scale and to the same scientific methodology as the national study. Having created the seven key principles, a second round of ecosystem services assessments was undertaken that drilled down into six separate urban issues, also to be seen as services: recreation, education, aesthetics and mobility, flood risk, local climate and biodiversity.

New geographic information system (GIS) maps of the city were created for each of these individual service assessments, displaying the results in terms of supply and demand.

It is well understood how natural environments 'supply' services to a human population. The ability of any natural environment to supply to a sufficient degree one service or a cluster of services depends on the 'demand' made by the local population. So, in the case of Birmingham, all six services were mapped against the city's population density. Overlaying all six service maps onto one city map resulted in a Multiple Challenge map that spatially articulates the dependency of the city's population on its natural environment. The creation of a single challenge map of a city based on ecosystem services science in this way represents a global first and as such has attracted a good deal of international attention.

The significant advantage of using the GIS mapping system is that once created it can be displayed or set to any scale. Birmingham has ten parliamentary constituencies, and many of its public services are delivered to these local boundaries. Therefore, to help the delivery and integration of this new knowledge, a map for each constituency has been created showing the citywide information laid over the local street plan. This very clearly indicates exactly where within each of these city districts the most effort needs to be made or where critical gaps in infrastructure need to be filled. As mentioned, the work of the citywide stakeholder group has been key. The community representatives for one specific district were chosen to be a pilot for the early release of this information. Community groups and third-sector organisations were able to use the evidence to pursue external funding for which the local authority was not eligible to apply. Over the course of 12 months during 2012/13, these community groups between them were able to apply for an additional £1.5 million, all aimed at improving the condition or accessibility of their local green infrastructure. Following this success, the community groups themselves decided to form an area-wide partnership that would enable them to bid for even more funding and work across these internal city boundaries.

The UK government, as part of the Natural Environment White Paper, also established a short life task force called the Ecosystems Markets Task Force, led by business for business. The aim was to

explore the market potential of a whole range of ecosystem services and how business might be able to see this whole development as a new economic competitive advantage. Birmingham, working with its lead business partner the UK Business Council for Sustainable Development (a national branch of the World Business Council for Sustainable Development), joined the Ecosystems Markets Task Force to explore options for Birmingham.

Natural Capital City Tool

What was identified as a gap in the market that Birmingham agreed to fill was to develop a site tool that could view potential development sites, utilising the latest scientific methodology devised through the national ecosystems assessment, to be successfully tested in Birmingham. What has been created, with the help of four industrial partners, is the Natural Capital City Tool (Holzinger, 2013). This is an Excel spreadsheet based assessment for sites ahead of the masterplanning stage that allows the developer to make choices, based on ecosystem services assessments, as to what to include or exclude within each development site. The spreadsheet allocates scores for all decisions based on a set of agreed preferred outcomes. The net result is that the development has a net benefit in terms of ecosystem services at the final analysis stage after a range of options and scenarios have been explored. The four industrial partners all helped to field test this tool and fed back their results to improve its robustness. The partners were La Farge-Tarmac, Skanska, CH2MHill and Severn Trent Water. Skanska has recently made further use of this tool on one of its key developments in the north of England. As a global company, it is interested in adopting the (final version) tool, as it fills what was an acknowledged gap in its Deep Green Assessment criteria, which it has devised to drive its international sustainable development business. The Tool is also being tested in Birmingham on a number of identified growth zones. What has been identified as a much-needed improvement is a standard set of unit measures or metrics that will work in all conditions. The city and its partners are actively seeking additional funding to address this gap in order to arrive at a final version of the tool.

Should the Natural Capital City Tool prove useable in all conditions and acceptable to developers, Birmingham City Council is likely to adopt it as one of

its mechanisms for overseeing and controlling future development in the city. Birmingham is due to publish its first sustainable development planning policy with Supplementary Planning Document status, which would require all future developments to follow the criteria and standards set out in that policy. This is where the Tool would sit. It could also be useful for the planning officers assessing future applications to see, through the Tool, how a developer arrived at their decision, what options they explored and which they chose and why. The planner could then advise on whether the chosen solution provides the best possible fit for that site. If this were all shared through an Open Source approach, then citizens and NGOs could examine the developer's decision-making in more detail, making the whole development process more democratic.

In order to help convey this body of work to the Natural Capital Committee, the governmental advisory panel, the city has met with and fully briefed the Committee's serving secretariat, and the detailed documents produced by Birmingham have been circulated to all members of the Committee. In 2014, the Committee published its second annual report (Natural Capital Committee, 2014) containing an update on progress against the aims and objectives set for it by the UK government, with their final report planned for the spring of 2015. The second report introduces an idea that the Committee is working on, which is a 25-year natural capital plan for the country. This will bring together a group of stakeholders and agencies, all of which are responsible for elements of managing the country's natural capital. The plan will outline how this could be better achieved, if aligned to a set of agreed long-term outcomes. The progress of the plan will then be monitored through a set of common metrics, again being worked on by Committee members and due to be finalised and published in 2015 alongside the plan.

A Natural Capital Plan

As Birmingham has advanced its work on natural capital ahead of many other UK cities, it is proposed that the city will also develop a matching 25-year natural capital plan based on its own findings (specific to Birmingham) but within the wider framework of the national plan. The existing citywide stakeholder group will be extended and engaged to undertake this work. For Birmingham, this will mean putting

nature at the heart of their future decision-making and at the centre of how future economic success will be measured. This will provide a totally new way of financing and managing the city's green and blue infrastructure and the city's natural capital. The UK Core Cities Parks Forum – representing Glasgow, Manchester, Leeds, Sheffield, Liverpool, Bristol, Nottingham and Cardiff – is very interested in this development and has offered its support.

Birmingham's Green Commission has published a Carbon Roadmap (McKay, 2013) that articulates just how the city intends achieving its very challenging carbon reduction target of 60% by 2028. The Roadmap introduces five-year carbon budgets to align with the national government's carbon budgets. The Roadmap is a cross-cutting series of actions around five themes, the actions detailed in each coming together to deliver the end result. The fifth theme is natural capital and adaptation, which is where the 25-year natural capital plan will sit. The city's natural capital plan will then be broken down into five-year delivery plans to fit with the carbon budget periods.

This natural capital plan approach has the potential to legitimately 'move' all environmental issues in the city and place them firmly within or across the economic growth and development plans. This will serve two direct purposes. First, it will ensure that the city develops within the carrying capacity of its natural capital, so not compromising future generations. Second, it will allow new mechanisms and instruments to be introduced that will fund the future management, maintenance and enhancement of the city's natural environment, in full recognition of its vital economic contribution. As a model for cities around the world to manage their natural environment in the future, this could provide real inspiration.

The Biophilic Cities Network

This point in the paper returns full circle back to the opening paragraph. Birmingham currently remains the only UK city invited to join the new global Biophilic Cities Network, on the strength of this level of research-driven policy.

Across the Biophilic Cities Network there is great interest in how cities can better combine centres of research with local government and third sector or

community-based delivery. Biophilic cities see the need to promote health and well-being as one of the most important city outputs. The cities in the network are convinced that this needs to be embedded within city spatial planning policy and coupled with environmental enhancement. The network is concerned with identifying consistent and, if possible, universal metrics. How can we get to the point where we can effectively benchmark what is being done in Rio de Janeiro with Singapore, and San Francisco with Birmingham?

Birmingham City Council believes that the natural capital plan approach might just provide one such mechanism. Outside of the Biophilic Cities Network, Birmingham is also having discussions with the European Investment Bank and DG Clima within the European Commission, trying to answer the question of what future natural capital investment would look like. What is being considered as a possible way forward is 'portfolio investment'. Here, some of a city's best sites would be combined with some of its worst, in order to try to guarantee a 'trickle-down' effect. This is one way of ensuring equity and improved environmental justice, while continuing to grow as a centre of economy. If the entry criteria for these portfolio investment packages also included a requirement for a natural capital assessment, then we could start to lock-in the 'three-legged stool' ambition behind sustainable development of achieving environmental, social and economic returns. Birmingham, through its natural capital plan approach, would like to be one of the first in this new investment market.

A Role for the United Nations?

When looking carefully at the ambitions behind the Biophilic Cities movement, it is possible to identify some very strong threads linking primary work around human health and around sustaining or improving biodiversity habitat. Internationally, these programmes of work are largely led and coordinated by the United Nations (UN). Therefore, it is contended here that Biophilic City status should be something that the UN should adopt to help drive these programmes.

The European Investment Bank is not the only global institution looking for solutions to securing future investment and, in particular, helping to address

and adapt to climate change. As demonstrated by the work in Birmingham, this whole programme completely links into and delivers the city's adaptation agenda. What these global investors are currently demanding is certainty related to climate change. They are demanding that governments around the world do more. As argued earlier, the solution may not come from national governments, but rather from global cities. Should the UN decide to back the research findings behind Biophilic Cities and agree to create a global accreditation system, then what might follow would be an entirely new global investment market of Biophilic Investment Portfolios. By 2050, 75% of the world's population is going to be living in cities. Now, in 2014, humans are at a point in our knowledge and understanding to be able to inform and direct the future of those cities. Should the Biophilic City model be applied, coupled with these investment markets, the result would be sustainable cities that are based on their natural capital and the well-being of their citizens and are future-proofed against climate change. This is why the UN needs to act soon on this matter, to help drive this desired outcome. It is certainly possible to predict where the human race will be by 2050 if it continues with 'business as usual'.

Conclusion

Within future cities, and increasingly within global cities in general, the place and importance of the natural environment, and within that the role of urban forestry, will only increase. The hope now within Birmingham is that by building this into the 25-year natural capital plan and linking that directly with economic output, the value of the natural environment will become increasingly recognised and acknowledged. This is to ensure that as a city Birmingham cannot go backwards, only 'forward', which happens to be the city's motto.

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