

Is the European Green Capital Award showcasing appropriate models of best practice for transition? The land use indicator.

Abstract

The European Green Capital Award (EGCA) rewards the efforts and commitment of European cities that tackle the environmental challenges of urban areas. These efforts are expected to have a positive impact on social and economic aspects, ultimately improving the overall sustainability of the city. Awarded cities are expected to act as a model and inspire other European cities by promoting best practice.

This paper focus on the land use indicator. Reviewed literature in the field distinguishes between urban form and urban development. Urban form is a snapshot in time while urban development refers to the processes that change and adapt the form over time. The analysis of the award's relevant indicator 'Green urban areas incorporating sustainable land use' points towards the significance of historical development to the current sustainability of cities' urban form.

This paper reviews recent urban development strategies for Bristol, the EGCA winner for 2015, and compares them to Stockholm and Barcelona; which achieved highest scores for the relevant indicator in earlier rounds of the award. While the strategies may be similar in all the cases, this study suggests that the two latter cities haven't shown a significant transition from unsustainability to sustainable land use in their recent development, but a maintenance of an already privileged urban environment. With a less favourable starting point, Bristol may represent a better model of best practice for other aspiring cities in transition by showcasing its recent and current positive results.

Is the European Green Capital Award showcasing appropriate models of best practice for transition? The land use indicator. Author: Angela Ruiz del Portal. Cardiff University

1 Context

The high density of activities taking place in urban areas creates environmental problems which impact on citizen's quality of life (petus n.d.) and the economy of the city. The consistent migration into cities and the prospects of 66% of the global population and 80% of Europeans living in cities by 2050 (United Nations 2014) stresses the urgency of finding sustainable solutions for the challenges that cities are already facing.

The implications of land use in relation to the three aspects of sustainability are now widely accepted:

“land is a finite resource and the way it is used is one of the principal drivers of environmental change, with significant impacts on quality of life and ecosystems as well as on the management of infrastructure.” (EEA 2010)

Environmentally land use influences the natural land uptake and impacts on biodiversity and ecosystems. Air and noise pollution and high fuel consumption are linked to the use of cars, where public transport is not cost effective and walking or cycling is not convenient due to long distances in dispersed settlements.

Socially, public health and quality of life are related to accessibility and availability of green areas for recreational activities. Social inequalities can result in relation to accessibility to services (mixed use) and public transport (dispersion).

Economically, density and compactness of settlements and the availability of a critical mass of users determine the cost-effectiveness of public transport and infrastructures, including distribution network of energy, water, and other collective services such as district heating.

European Directives (Commission of the European Communities 2006; Council of the European Union 2006) encourage and promote the network of local governments to share experiences and best practice. With this aim the European Commission (EC) launched the European Green Capital Award (EGCA) in 2008. The EGCA rewards the efforts of European cities that tackle the environmental challenges of urban areas (EGCA 2010). The awarded cities are expected to act as a model inspiring other cities and promoting best practices. ‘Green urban areas incorporating sustainable land use’ is one of the indicators city candidates are evaluated against. This indicator was previously divided between the indicators that separately assessed green urban areas and sustainable land use (Table 1); although some documents from the two first rounds (Berrini & Bono 2010; EGC 2010) already considered the two indicators together. Including green and blue areas within the study of sustainable land use is consistent with literature around the topic (Williams et al. 2000; Jabareen 2006).

Table 1. Evolution of EGCA Indicators in relation to land use.

2010 & 11	2012 & 13	2014	2015	2016
Availability of green areas open to the public	Green Urban areas	Green urban areas incorporating sustainable land use	Green urban areas incorporating sustainable land use	Green urban areas incorporating sustainable land use
Sustainable Land Use	Sustainable Land Use			

For each indicator EGCA requires cities to describe a) the current situation; b) strategies implemented in the last 5 to 10 years; and c) objectives and strategies for the future. For the ‘Green urban areas incorporating sustainable land use’ indicator these aspects are easily comparable to the concepts that are distinguished in land use literature: urban form and urban development. While urban form is purely descriptive and refers to static characteristics of the

morphology of a city for a specific moment in time, urban growth or urban development is the dynamic process that alters urban form over time (Schwarz 2010; Neuman 2005) With regards to sustainability, Neuman (2005) states the primacy of process over form.

Award documentation (Berrini & Bono 2010) originally promoted an urban form that is compact and dense; a city model that presents a mix of uses in balance with availability of green spaces. More recently award’s best practice documentation (O’Neill & MacHugh 2015) advocates “...balance between the needs of urban, rural and residential areas...” as well as “...preserving and adapting open spaces to improve quality of life while also combating climate change.”. This latest discourse doesn’t stipulate a determined urban form. With regards to development strategies award’s best practice documents defend those that prevent sprawl such as redevelopment of brownfield (Berrini & Bono 2010; O’Neill & Rudden 2011) and densification (O’Neill & Rudden 2011).

This paper evaluates whether cities highlighted by the EGCA can inform other cities on their urban development to achieve a transition towards a more sustainable urban form.

2 Methods

To achieve its aim the paper evaluates urban form and development strategies in Bristol, an EGCA winner, and compares it to two other front-running cities, Stockholm and Barcelona, with regards to the ‘Green urban areas incorporating sustainable land use’ indicator.

The study of the historical urban development helps to understand the inherited urban form and the difficulties and potentials that it poses. Current and future urban development strategies can then be evaluated independently from the inherited situation. The analysis of the cities considers in this respect a) inherited urban form as a result of historical development (i.e. current situation); b) recent and future urban development (i.e. strategies implemented in the last 5 to 10 years and future strategies).

Documents that report on cities’ urban form and historical development from the early 1900s were studied. Bristol, Stockholm and Barcelona EGCA applications and Panel evaluations were also reviewed in order to gather data and to analyse and compare the cities’ recent and future urban development. Given the years of the applications to the award that are reviewed here - Round 2010-11 was evaluated in 2009 while round 2015 was decided in 2013- the time frame considered for cities’ development strategies dates back to the late 90s.

3 Case study cities

Bristol applied for the EGCA in 2010/11. It had the lowest score for Sustainable land use of all short-listed cities (Table 3) and had the third lowest combined score for available public green space and sustainable land use. However, on reapplication in 2015, Bristol achieved the highest score for ‘Green urban areas incorporating sustainable land use’ indicator (Table 2).

Table 2. EGCA 2015 short-listed cities’ ranking for ‘Green urban areas incorporating Sustainable land use’ indicator. Data source: RPS Group 2013

City	Green urban areas incorporating sustainable land use	Final Technical Ranking
Bristol	1	1
Brussels	3	2
Ljubjana	4	3
Glasgow	2	4

Among the ten largest cities in the United Kingdom (UK), Bristol has grown in a hilly location along the river Avon in the South West of England. Since 1996, the Bristol-City-Region has been divided into four different local authorities. Only the area denominated Bristol City Council (BCC) applied for the EGCA and is evaluated here.

Stockholm achieved the highest combined score for ‘Green areas’ and ‘Sustainable Land Use’ in the round 2010-11. The capital city of Sweden also obtained an overall highest score in the contest and was awarded European Green Capital (EGC) 2010.

Situated where Lake Malar meets the Baltic Sea, on the south-east coast of Sweden, Stockholm occupies 14 islands linked by bridges around a large and well-preserved medieval city centre. The City of Stockholm, evaluated by the award, is the centre of the Metropolitan Stockholm or Stockholm County, the largest of the three metropolitan areas in Sweden.

Table 3. Breakdown of short-listed cities' scores EGCA 2010 & 2011. Data source: EGCA, 2009

City	1. Availability of green areas open to the public	2. Sustainable land use	Sum-up of 1 and 2 scores (rank)	Total score (rank)
Hamburg	11	10	21 (7, 8)	161,4 (1)
Stockholm	13	11,5	24,5 (1)	157,3 (2)
Münster	13	10	23 (4, 5)	155,4 (3)
Amsterdam	12,5	11	23,5 (2, 3)	150,3 (4)
Freiburg	13	10,5	23,5 (2, 3)	147,7 (5)
Oslo	13	10	23 (4, 5)	143,0 (6)
Bristol	12	10	22 (6)	136,2 (7)
Copenhagen	10	11	21 (7, 8)	131,6 (8)

Barcelona achieved the highest combined score for ‘Green areas’ and ‘Sustainable Land Use’ in the round 2012-13. (Table 4). The city of Barcelona is the second largest city in Spain. It lies on the Mediterranean coast and is surrounded by two rivers and a coastal mountain system that runs parallel to the sea. It is the main core of the Metropolitan Region of Barcelona (MRB) which stands out as one of the most dense and urbanized regions in Europe.

Table 4. Breakdown of short-listed cities' scores EGCA 2012 & 2013. Data source: EGCA, 2010

City	1. Availability of green areas open to the public	2. Sustainable land use	Sum-up of 1 and 2 scores (rank)	Total score (rank)
Barcelona	11,5	12,5	24 (1)	168,3
Malmö	12	11,5	23,5 (2)	167,7
Vitoria-Gasteiz	11	10,5	21,5 (3)	166,6
Nuremberg	9	9	18 (4)	152,35
Nantes	10	7	17 (5, 6)	149,3
Reykjavik	10	7	17 (5, 6)	142,6

4 Analysis of historical urban development and inherited urban form

Parameters related to urban form describe the state of the city as it is at the moment. As current situation, urban form can be considered the result of past urban development. This section explains the historical urban development and resulting urban forms in the three studied cities.

4.1 Bristol’s historical urban development and inherited urban form

At the beginning of the 20th century Bristol ceased to be a commercial port after almost a thousand years. Despite the industrial expansion Bristol kept a broad economic base and was not among the front running cities during the industrial revolution. This protected it from the economic decline that affected many industrial cities elsewhere in Britain in the 1930s. At that time urban development was focused on slum clearance and road building.

The Second World War (WWII) brought large-scale destruction to Bristol’s medieval city. As early as 1941 plans for reconstruction began to be released. The general approach of these proposals tended to ignore what was left by the war to favour grand planning, zoning and uniform building designs. This tendency achieved its maximum expression in the

Reconstruction Plan of 1946 (Tallon 2007). Only scattered pieces of those plans were actually realised. Given that traffic planning was central to the plans, the result today is a patched traffic structure with plenty of compromises (Foyle 2004). Post-war, the population in the city centre significantly declined and housing concentrated in the suburbs. This was a common process of “decentralisation” in the UK.

From 1950 to 70s redevelopment plans demolished historic buildings at a rate approaching war-time bombing levels (Foyle 2004). In the 1950s Broadmead shopping centre was built to replace the commercial streets that had been destroyed during the war. In 1950-60s some inner areas of 19th century terraces were replaced with 15-storey blocks and large-scale office blocks were built around Broadmead. A post-industrial economy with strong financial, service and information businesses left redundant industrial sites. 1973 saw the closure of city docks and radical proposals for large-scale office and housing development in the surrounding area threatened the character of this historic industrial zone (Shaftoe & Tallon 2009).

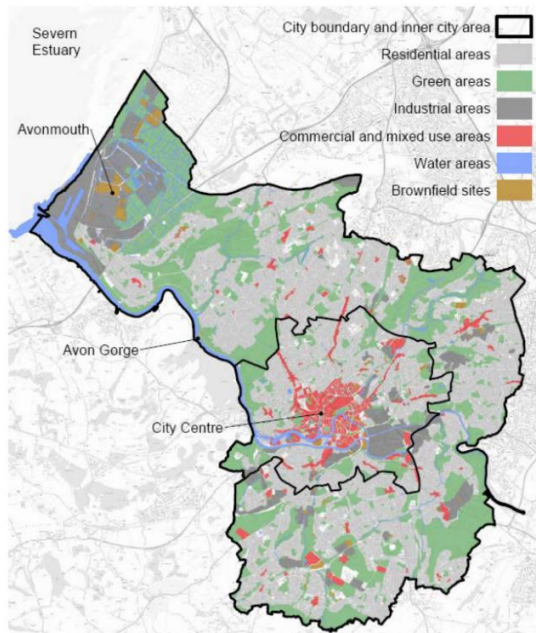
1960-70s witnessed the raise of popular protests that expressed the growing dissent at controversial schemes (Foyle 2004). In 1970-5 the Conservation movement became the turning point in Bristol's post-war development. Twelve Conservation Areas were designated and clearance programs were dropped favouring building reuse or construction of smaller buildings. At national level schemes of conservation, repair and reuse were encouraged by government grants. Regeneration of redundant industrial sites started in the mid-70s, focussing on the Harbour and brownfield sites around the main railway station. The Harbour area was the first large-scale housing development since the beginning of the 19th century. With the inclusion of leisure activities this area began to acquire a new role as an entertainment space.

In 1978 a new green space (Castle Park) became the 'hole in the heart' that came from clearing the buildings left after the war instead of rebuilding the area around the historic core. This has resulted in a fragmented city centre (Shaftoe & Tallon 2009).

During 1980-1990s the population growth registered in the region was concentrated in local authorities around the city rather than within it.

In 1996 Bristol regains its status as City and County of Bristol. Since 1974 it had been subsumed in the County of Avon now abolished. From this date some sections of the conurbation became dominated by neighbouring local authorities.

Bristol's inherited urban form



In terms of built-up area Bristol presents a polycentric development in which density concentrates mainly in the city centre and along the main public transport lines (i.e. high streets), although some nuclei fall far from those lines.

Figure 1. BCC Land use. Source: BCC 2013

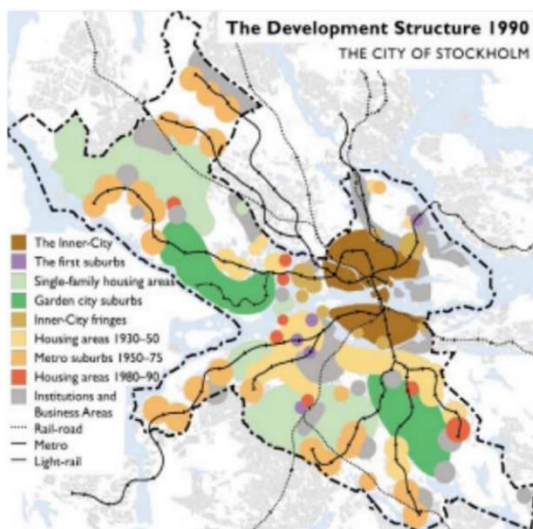
According to Schwarz's classification, Bristol and the other cities in its cluster are characterised by “an above average mean patch size, a smaller number of patches and a higher population density. ...they have only few, but large sealed patches. This hints at compact development, however with several centres...” (Schwarz 2010).

4.2 Stockholm’s historical development and inherited urban form

Stockholm’s historic development run in parallel to Social Democrat government plans to improve housing during the 30 years since 1934 that the party ruled Sweden. The late process of industrialization and development in Sweden permitted Stockholm to learn from earlier developed cities. Sven Markelius’ General Plan in 1952 put Howard's garden city concepts into practice about 50 years after the first garden cities in UK. Markelius accepted the inevitable suburbanization and planned satellite new towns that were connected by rail to the preserved commercial and cultural city centre. Countryside areas in between the new towns were also maintained. It is worth noting the planning decision of providing a higher density than that demanded by the people. Markelius disregarded Swedish people's preferences for low to mid-rise suburban homes and planned quite dense satellite centres. This was achieved by the construction of multi-storey apartment blocks as the residential typology. The differences in density from UK garden cities worked in favour of Stockholm’s public transport system's efficiency. Most of the inhabitants could live within walking distance of public transport, making car use superfluous.

Between 1950 and 1968 the first generation of new towns were built in parallel to the railway system which had been planned to cope with the increased demand. Mixed-use and housing types were implemented to avoid monotony of suburban dormitory towns. Industry and offices were planned in proportion to population that was housed in both single-family and multi-tenant buildings. This was possible thanks to public control of land and tax incentives (Cervero 1995).

Since 1975, with the 1st environmental programme for the city, a densification strategy replaced the previous expansion in order to preserve natural land within the limits of the city (Hall 2009).



The inherited urban form in Stockholm is made up of a number of compact, dense, and mixed-use nuclei scattered throughout the territory along the railway lines. This dispersion may not be generally accepted as a characteristic of sustainable urban form. However, the combination with an efficient public transport system results in a highly sustainable configuration, allowing the integration of a large share of natural green areas within the city.

Figure 2. The City of Stockholm. Urban development until 1990. Source: Stockholm City Planning Administration, 2001

Cities in Stockholm’s cluster “slightly differ(s) from the average of the sample...mainly because of a higher edge density and a lower number of patches. They have few, but ragged sealed urban patches” (Schwarz 2010). Stockholm's form is quite common among European cities.

4.3 Barcelona's historical development and inherited urban form



Plan Cerdà in 1860 provided a comprehensive, organised and efficient matrix for development to superpose over the walled city of 130ha and scarcely 150,000 inhabitants surrounded of several villages on the Barcelona Plain in the early 19th century. This Plan has been the basis of Barcelona's urban development until today.

Figure 3. Plan Cerdà for Barcelona.
Source: DensityAtlas.org

Until 1930s the growth was gradual and harmonized with residential, industrial and commercial uses intermingled. However, in the post-civil war years (1940s-1975) an authoritarian political system allowed an accelerated process of land occupation with speculative residential development and scattered industrial growth, both within and at the periphery of the city. The unbalanced urban development during the regime risked the good characteristics and the liveability of Barcelona.

The **Metropolitan General Plan in 1976** set the basis for the strategies that would be applied during the next 25 years. Since 1980s the city has been working in the continuous improvement of the existing urban environment through **transformation of derelict areas, building on brownfield**, and a constant effort to **regain and increase open/green spaces for the public**. In many cases these **urban acupuncture** or 'sponging' interventions undertaken by the local authority, not necessarily of high cost, are good examples of improvement of an already highly developed urban environment. These years rehabilitation and restructuring projects were based on spatial quality and reorganization of the city with particular emphasis on infrastructure and new urban spaces (Charlesworth 2005). Projects for the Olympic Games 1992 can also be included within that spirit, the so-called 'citizen's urbanism', executed by public authorities and that provided what people needed by building city within the city (Romero 2008).

The natural limits of the city (later reinforced by the city's infrastructures), together with the high attraction of the city for newcomers and the flexibility of Cerdà's matrix to absorb population have resulted in a city with one of the highest densities in Europe. As a result, Barcelona's urban form is paradigm of the traditional Mediterranean compact city model. This model is characterised by high density, compactness and complexity of uses intermingled both in the urban space and in mixed-use buildings. This mixed-use confers vitality and liveability to the urban nuclei. The compactness and density allows a highly efficient public transport system while the share of public green areas remains restricted.

Schwarz's classification clusters Barcelona together with Athens, Thessaloniki and Paris. Cities in this cluster are characterised by a *"very high population density, high population number and higher mean patch size, while the number of patches is lower than the average"* (Schwarz 2010). This means large and dense metropolitan areas with a highly intensive use of land.

4.4 Discussion on historical development

Tables 5 contrasts historical processes that affected past development in Bristol, Stockholm and Barcelona.

Historical development in Stockholm and Barcelona shows comprehensive plans that were applied early on and have been consistently applied to the development of the cities until today. However, the form of those plans are quite different from each other. The polycentric structure that spreads throughout the territory with abundance of natural land in Markelius' Plan contrasts

against the compactness and mono-nuclear structure in Cerdà's matrix, the densification of which left a shortage of green spaces. And while Markelius' original plan for Stockholm integrated transport as key factor for development, in Barcelona the implementation of an efficient public transport network came afterwards, capitalising on its compact and dense form.

In contrast, Bristol's history in the 20th century has been one of demolition and reconstruction in a succession of plans that have failed to provide the city with a coherent and comprehensive structure. Post-war decentralisation emptied the city centre and the early regeneration and densification of the many sites available in this area stretched since early post-war times until today. As a result, density is not as low and suburbs are not as spread as in other British city locations. Still, in light of the objectives of the award, urban form may not show the highest environmental standards, while two important threats derive from past development. These are a dysfunctional traffic system that has been inherited from the time of post-war reconstructions and a fragmented governance of the region which may result in uncoordinated decisions.

Table 5. Summary of historical plans and its strategies in relation to land use.

Bristol	Stockholm	Barcelona
<p>1930s Slum clearance and road building</p> <p>WWII – large scale destruction of medieval city</p> <p>1941-6 Several reconstruction plans. Partially undertaken</p> <ul style="list-style-type: none"> • Demolish for reconstruction • Grand planning, zoning and uniformed building designs <p>1940s Post-war decentralisation</p> <ul style="list-style-type: none"> • Decline of city centre population • Housing concentrated in suburbs <p>1950-75 redevelopment plans</p> <ul style="list-style-type: none"> • Demolish for reconstruction <p>1960-70s post-industrial economy. Redundant industrial sites</p> <p>1970-5 Conservation movement Building repair and reuse</p> <p>Mid-70s Regeneration brownfield</p> <p>1978. ‘The hole in the heart’</p> <p>1980-90s growth in neighbouring regions</p> <p>1996. City and County of Bristol</p>	<p>Since 1904 purchase of land for future development</p> <p>1920-30s industrial expansion / housing shortfall</p> <p>1934-60s Social housing in outskirts</p> <p>Markelius Plan 1952</p> <ul style="list-style-type: none"> • Expansion – new towns • Preservation - centre and natural land • Rail system <p>1950-68 1st new towns + railway</p> <ul style="list-style-type: none"> • Mixed housing types and use <p>Mid 70s. 1st Environmental programme.</p> <ul style="list-style-type: none"> • Densification • Preservation 	<p>1863 Plan Cerdà</p> <ul style="list-style-type: none"> • Expansion – integration of former neighbouring villages <p>Until 1930s – gradual and harmonized growth. Mixed use</p> <p>1940s -75 Post-civil war Dictatorship</p> <ul style="list-style-type: none"> • Accelerated process of land occupation. • Speculative residential development <p>Mid 1970s Democracy</p> <p>General Metropolitan Plan 1976 “citizens’ urbanism”</p> <ul style="list-style-type: none"> • transform derelict land into parks • Urban acupuncture • infrastructure + urban spaces

4.5 Discussion on inherited urban form

Table 6 summarises quantitative data and description of urban form. While table 7 shows population evolution. Cities’ efficiency in their use of land is also compared.

Comparison between data in table 6 may be problematic. Stockholm’s application (2008) points out that there is not a unique system to account surfaces. Streets are included in built-up area but parterres on public streets are counted as green spaces in Barcelona. Barcelona actually includes also squares as well as parks and gardens and it adds “*This group must also include the green areas in the city’s cemeteries, as well as sports facilities, beaches*”. Stockholm, however, mentions wood, open area, semi-open area and wetland. Also, some candidates include privately owned green areas within this section. These are all spaces with very different

quality that are perceived and enjoyed in very different ways by the citizens. Their inclusion in one single category may be misleading and doesn't allow for fair comparison.

Table 6. Summary of parameters of urban form for the three case study cities. Data sources: ¹City of Bristol 2008; ²BCC 2013; ³Stockholm 2008; ⁴Barcelona 2010; *Berrini & Bono 2010; **EGC 2009(1).

		Bristol 2010 ¹	Bristol 2015 ²	Stockholm ³	Barcelona ⁴
Breakdown of areas	Water area	Na	3%	10.04%	-
	Green area	16.22% publicly accessible	31% 15% public	49.48%	35.92% 29% public
	Built-up area	Na	66%	40.48% (10 % roads)	56%
Green area per inhabitant (sqm/inh)		38		86*	22.5 18 public
Inhabitants living less than 300 m from a public green area		Na**	88%	95%**	99.4%
Urban form description (Schwarz 2010)		Relatively high dense city centre (22% of land) surrounded of low-dense post-war residential suburbs (78% of land)		Polycentric metropolis made up of compact and mixed-use urban nuclei.	Highly dense and compact urban environment with high degree of mixed-use
Green areas structure		- Great amount of green spaces, most of them underused - Residential area almost completely matched by green areas. (O'Neill & MacHugh 2015)		- Natural structure of water and green areas intermingled	- Shortage of high quality green spaces
Transport		- Transport mainly based on cars, nuclei not linked to main transport system		- Closely interrelated with public railway transport	- Efficient and varied public transport system

Table 7. Population and density evolution in Bristol, Stockholm and Barcelona since 1900. Data sources: ¹Intelligence West 2010; ²City of Stockholm 2009. ³Statistical Institute of Catalonia 2011; *Berrini & Bono 2010; Est. = estimated; Na=Not available

	Bristol ¹ A= 110 km ²		Stockholm ² A= 188km ²		Barcelona ³ A=101.4 km ²	
	Population	P. Density	Population	P. Density	Population	P. Density
1900	Na		301,322	1,670	544,137	Na
1950	Na		744,562	3,970	1,280,179	Est. 12,750
1960	Na		est. 808,340	4,310	1,557,863	Est. 15,363
1980 ^a -1981	401,200	Est. 3,645	647,214 ^a	3,450 ^a	1,754,900	Est. 17,306.7
1995	Na		711,119	3,780 est.	1,769,014	Est. 17,445.9
2000-2001 ^b	390,000 ^b	Est. 3,545	750,348	4,000	1,474,134	14,763.4
2005-2006 [*]	426,100 [*]	3,732 [*]	771,038	4,200	1,577,303	15,718.6
2009 ^c -2010	433,100 ^c	Est. 3,940	847,073	4,510	1,607,653	15,977.7

A = Area of land; Population (inh=inhabitants); P. Density (inh/ km²= inhabitants per km² of land)

The data gathered illustrates the differences in urban form between these three cities, as Schwarz's (2010) classification confirms. These differences are somehow evident in fig. 6. However, if we consider the different population, density etc. (table 7) the comparison of areas in fig. 6 can be misleading. To allow for direct comparison of efficiency in the use of land fig. 7 simulates area of cities for a hypothetical equivalent number of inhabitants.

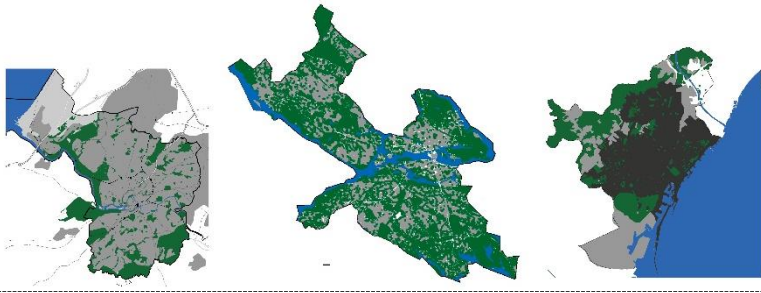


Figure 6. Comparison of extension of land occupied by Stockholm, Barcelona and Bristol. Water, green and built-up areas. Source: author

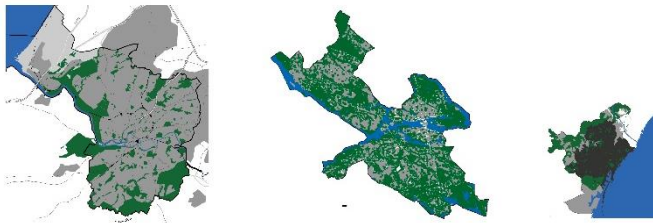


Figure 7. Comparison of area of land occupied by Stockholm, Barcelona and Bristol for a hypothetical same number of inhabitants. Source: author

Fig. 7 illustrates Barcelona's efficient use of land in comparison with the other two case study cities. This figure can also be used to consider the amount and distribution of green space available for the inhabitants in each case. While this is outstanding and evenly distributed in Stockholm, it is more limited and mainly concentrated in big lumps around Barcelona's and Bristol's urban territory. Barcelona and Bristol present a built-up area that is concentrated in one big urban centre although with differences in density. While in Stockholm the built-up area is scattered and intermingled with areas of natural land and water throughout the territory.

4.6 Urban Form Conclusion

As a result of its historical development Bristol's urban form has been characterised by an abundance of voids and brownfield sites around the historic core, either due to war destruction or redundant docks and industrial sites. In the inner city and the suburbs similar landscape to other inter-war and post-war low-dense residential developments has been reproduced. An abundance of parks and green areas, although somehow neglected, constitutes an important asset for the city to be restored. The succession of partially implemented post-war reconstruction plans resulted in a dysfunctional inner city traffic network.

Barcelona is arguably the perfect example of the urban form that the award promotes. The city reports social cohesion, access to services and optimisation of systems as direct benefits of its form (Barcelona 2010). And yet, it is the high density and compactness that account for the historical lack of green spaces in Barcelona. Nonetheless, the efforts applied in the last 30 years has significantly increased green space availability in Barcelona. More illustrative is to know how city management seizes upon this efficient land use. In this sense the important tax revenue that the high population density allows has enabled Barcelona to implement numerous public projects; including the recovery of green areas and a sustainable transport system that capitalise on the compactness of the urban form. This example suggests questions such as how much green space is enough, what counts as green space (e.g. tree lined streets, paved public space with trees) and whether there is value on having green space that the city cannot maintain.

The lesson to be learned from Stockholm is that while the dispersed urban form alone may not be in principle considered sustainable this dispersion can take forms that are different from the reviled sprawl. Stockholm in this case showcases a highly sustainable urban structure resulting from the balanced coordination of three aspects: land use, green areas and transport system.

5 Urban development

Urban development strategies for each case study city are reflected in the actions taken by the local authorities in the time frame evaluated by the award (i.e. 5 to 10 years prior to cities' application to the award). And those planned for the future.

5.1 Bristol's urban development

Bristol Local Plan 1997 designated priority Regeneration Areas, Housing Renewal Areas and sites for new employment and new housing developments (City of Bristol 2008); while the City Centre Strategy 1998 united previous efforts for regeneration. The 1998 plan coordinated three ongoing regeneration projects in the city centre (Punter 2009) 1. Broadmead shopping centre area; 2. Harbourside, ongoing since 1970s; 3. Office and housing quarter by Temple Meads railway station, ongoing since the late 1990s - examples of zoning applied in post-war decades. Following Urban Task Force (1999) guidelines and with the focus on city centre regeneration, there has been some success in increasing the density of the city and, to an extent, introducing mixed-use through brownfield redevelopment and re-population of the centre (Punter 2009).

Housing became a significant element of Harbourside's regeneration. Low rise developments of primarily private houses were built beginning a gentrification process. This process continued with the majority of new city centre housing targeting an exclusive market and with rising land values (Foyle 2004). However, **community-led developments** were also happening. In the inner suburbs, planned schemes and individual owners have undertaken its rehabilitation.

The fragmented **governance** in the city-region since 1996 negatively influenced the urban development of Bristol. This has resulted in a spatial imbalance in jobs and housing that accumulate in the north area (Tallon 2007). While the city of Bristol encouraged building on brownfield, the northern edge of the city, under different local authority, developed on greenfield and has until recently absorbed the demand of the sustained growth in the region.

Shaftoe and Tallon (2009) summarised the last couple of decades in the following points: a. design and renaissance of public spaces; b. central city urban regeneration projects; c. policy interventions in the inner and mature suburbs; d. smaller-scale but enlightened developments in the inner city and suburbs; e. transport.

The series of plans for the city centre – 2001 Revision of City Centre Strategy 1998; Bristol City Centre Strategy and Action Plan 2005-2010 - and strategies that the city has followed in the first decade of the 21st century - redevelopment of brownfield sites, urban infill and densification of the city centre - have continuity in the Bristol Development Framework Core Strategy 2011. The Core Strategy was presented at in BCC 2010 as future plan for development.

The Core Strategy signifies the implementation in 2011 of a comprehensive plan for the entire city. This new land use policy strengthened the protection of green areas in BCC that was included in the Bristol Local Plan (1997). The plan promotes: a. higher densities; b. mixed-use balancing jobs and houses; c. continuity with residential developments with more diverse housing types; d. connectivity, accessibility of areas; e. more efficient use of underused land.

Bristol's Parks and Green Space Strategy was adopted in 2008. Although the proportional area of green spaces in the urban environment is high the quality and maintenance is in consistent decline. The strategy aimed to improve the quality and accessibility of these spaces.

2010 evaluation panel (EGCA 2009) praised Bristol's efforts to increase compactness and density of the city while protecting the green belt. This was partly achieved by concentrating developments on brownfield for nearly all new offices and light industries and most of residential developments, but less for industrial and warehouse. This, together with the cooperation with hinterlands helped to avoid urban sprawl. Moreover, population density, although only medium in relation to other short-listed cities', had doubled over the previous decade. By 2015 application, urban regeneration and conversion of historic buildings into apartments have helped to further raise population density in the centre of Bristol. In general density is maintained and increased through planning. This more efficient use of land in new developments while protecting green spaces is a high priority. The Expert Panel for EGCA

2015 (RPS Group, 2013) highlighted the high percentage - more than 90% - of developments that have been carried over on brownfield. Harbourside and Temple Quay were pointed out as example of inner city regeneration projects that provided high-density, mixed-use neighbourhoods. The Jury report (EGC 2013), moreover, praised the “...*bottom-up community-based initiatives...*” that are common in the city.

The 2010 evaluation panel also recognised the high share of public green space per capita in the city, despite the lack of data about accessibility. It made a positive appraisal of the standards and strategy for green space, positively assessing long term planning and the strong commitments for the future. The improvements presented at 2015 application (BCC 2013) also included the increase of public green space with 6 new city centre open spaces and the acquisition of 80ha at Stoke Park State. The Strategic Green Infrastructure Network contained in the Core Strategy helps to maintain, enhance and plan the connectivity of the green network.

In contrast, the appraisal remarks the low share of population with near access to public transport which results on a high share of car mobility. However, the actions taken in the city centre include several initiatives for reduction of car traffic (EGCA 2009). These have been reinforced by 2015 application (BCC 2013) with initiatives such as car sharing, car clubs or promotion of community car-free days.

The Good Practice Report of that year (O’Neill & MacHugh 2015) includes the ‘West of England Partnership’ “...*which ensures that strategic housing, transport and green infrastructure are coordinated between these authorities. Consequently, growth focuses on existing centres and brownfield land and protects ‘established Green Belt’ land, which in turn limits urban sprawl.*” The report also acknowledge the Strategic Green Infrastructure Framework and the benefits for green areas and their connectivity through green corridors.

In summary, apart from the realisation of plans and the reinforcement of incipient actions that already appeared in 2010 application the novelties in Bristol’s 2015 application with regards to urban development may be reduced to the establishment of the West of England Partnership which counterbalances the risk posed by a divided governance in the region since 1996.

5.2 Stockholm’s urban development

Stockholm’s record of environmental programmes beginning back in 1975 means a long history and an early awareness and implementation of preservation strategies. Since then Strategic Development Areas have been defined and developed, and again new Strategic Areas have been defined for prospective development following the densification strategy. Nevertheless, new towns have been built however always maintaining the original interrelation between transport system and urban development. In essence, the last 10 years before applying for the award the city had continued doing what it did for the previous 25 years. This densification strategy was expressed in the slogan ‘Building the City Inwards’ that was presented to the award (Stockholm 2008) but that already appeared in the planning strategies for the city from 2001.

The “...*high compactness with high accessibility to green areas and a very high population density in built up areas;*” that was praised by the award (EGC 2009(1)) had been achieved through **redevelopment of brownfields** and the integration of population growth within the city; always linking these interventions to the tram system. The main future strategy was the continuity of the previous while maintaining the good characteristics of the city’s structure (Stockholms 2008). Measures were also in place to **develop new green spaces and improve existing ones**. This continuity was positively highlighted by the jury in their conclusions (EGC 2009(2)). It could be argued that the densification strategy has a limit and at some point greenfield will have to be developed to cope with the increasing population. This extreme is already contemplated in the Environment Program 2008-2011 which says that compensation

will be required for development on greenfield (Stockholms stad 2008). Development on greenfield then is not rejected but discouraged.

5.3 Barcelona's urban development

The beginning of the 21st century has witnessed in Barcelona the transition from "citizen's urbanism" to "business' urbanism" where private interests control urban development. By regulation the local government ensures that developments include the public space necessary in the dense city (Romero, 2008) however, public acceptance of these projects is quite limited.

The Territorial Metropolitan Plan 2010 (Generalitat de Catalunya, 2010) is put in practice ruling the urban development of the metropolitan region. It is a comprehensive plan that addresses the complex reality of the region beyond the limits of the city. With regards land use the plan establishes five key strategies 1.more efficient use of land 2.strategic nodes 3.balanced mixed-use 4.transport network. Connectivity 5.integration of green space structure.

The evaluation panel (EGC 2010) highlighted the efficient use of land that results from the high population density. However, the panel also noted the challenge that the dense and compact form posed in terms of green area provision and how this was achieved in Barcelona through active management and the Green Area Strategic Plan. The transfer of industries to the outskirts of the city allowed the creation of new green areas in the inner-city as well as the recovery of space including beaches. The panel also notes how Barcelona has seized its very dense "*Mediterranean city model*" in the transport subject. The city has a comprehensive local public transport network that includes bus, metro, tram and a bike share scheme that was introduced in 2007; 80% of trips within Barcelona are made on foot, by bicycle or on public transport.

5.4 Discussion on urban development

Data on the urban development of the three case studies is summarised here for their comparison. Table 8 compares quantitative data illustrating differences and similarities in their recent urban development. While table 9 contrasts recent plans and strategies for the three cities.

Table 8. Summary of parameters of recent urban development for the three case study cities. Data sources: ¹City of Bristol 2008; ²BCC 2013; ³Stockholm 2008; ⁴Barcelona 2010; ⁵Berrini & Bono 2010; **EGC 2009(1); ***Table 6

		Bristol 2010 ⁵	Bristol 2015 ²	Stockholm ⁵	Barcelona
Population change 2005-10 (inh) est. (% per yr)***		7,000 (0.354) (2006-9)		76,035 (0.964)	30,350 (0.384)
New dwellings (2005-10)		12,996	21,838 (2002-12)	22,596	16,575
New developments	On brownfield	45% industrial 93% residential (1997-2007)	98% business 63% industrial 94% residential (2002-2012)	30% residential (2000-2007)	Na
	Densification	Na	---	70%	Na
	On greenfield	16.40% ^[5]	2% business 37% industrial 6% residential	---	Na
New developments. Population density		140 inh/ha ^x	129 Inner-city 303 city centre 56 suburbs dph	112.44 inh/ha ^[3]	62 inh/ha ^x
Density in existing built-up area inh/ha	City centre	Est. 137		42 ^[3]	292
	Suburbs			32 ^[3]	

inh/ha= inhabitants per hectare; dph = dwellings per hectare; ^xdata for 'A' new development

In all three examples the current strategies that are applied focus on redevelopment of existing urban land and preservation and enhancement of green areas. However, Stockholm 'chose' to preserve a structure of natural land that make up half of its territory with high capacity to maintain biodiversity and ecosystems; Barcelona has been pushed by the lack of undeveloped

land to regain green space through restoration of land within the city; and Bristol works to improve quality and accessibility of these spaces. Finally, the preservation of greenfield is made by limiting interventions to those on brownfield. These interventions look for densification in the relatively medium dense Stockholm and Bristol, while the developments undertaken on Barcelona's brownfield sites tend to reduce the average of an extremely high population density.

Table 9. Summary of recent plans in relation to land use.

Bristol	Stockholm	Barcelona
<p>Bristol Local Plan 1997</p> <p>The City Centre Strategy 1998</p> <p>Review of City Centre Strategy 1998 (2001)</p> <p>City Centre Strategy and Action Plan 2005-2010</p> <ul style="list-style-type: none"> • renaissance of public spaces • central city regeneration • develop inner city suburbs • transport <p>Mid-00s West of England Partnership</p> <p>2008 Parks and Green Space Strategy</p> <p>Strategic Green infrastructure network 2011</p> <p>Core Strategy 2011</p> <ul style="list-style-type: none"> • higher densities • mixed-use. jobs - houses balance • connectivity, accessibility • more efficient use of land 	<p>1980-90s Strategic Development Areas</p> <p>The Stockholm Comprehensive Land Use Plan 99</p> <p>- 1999 Stockholm City Plan</p> <ul style="list-style-type: none"> • Intensive + mixed land use <p>Building the city inwards 2001</p> <ul style="list-style-type: none"> • re-use of land; • re-develop industrial areas • mixed use • focal points in suburbs; • connect new development areas • develop public spaces <p>Stockholm Environmental programme 2008-11</p> <ul style="list-style-type: none"> • Maintenance of structure • Enhance natural areas • connect nuclei <p>Comprehensive land use plan 2010</p> <p>Improve accessibility Attractive green areas</p> <p>The Walkable City, 2011</p> <ul style="list-style-type: none"> • Strengthen centre • strategic nodes • Connect city areas • Create vibrant urban environment 	<p>Continuation with Pla General Metropolitana of 1976</p> <p>2000s “business’ urbanism”</p> <p>Territorial Metropolitan Plan, 2010</p> <ul style="list-style-type: none"> • more efficient use of land • strategic nodes • balanced mixed-use • transport network. connectivity • integration of green space structure

5.5 Urban Development Conclusions

Strategies in practice in Bristol during 2010 application were essentially similar to those in Stockholm or Barcelona. Namely, redevelopment on brownfield, densification, introduction of mixed-use, preservation and enhancement of undeveloped land as well as improvement of connectivity between different areas and accessibility of green spaces. In light of the objectives of the award, 'land use' in Bristol may not have been achieving the highest environmental standards, although the high rate of new developments built on brownfield or the trends increasing density and mixed-use were good values to be considered. The continuation and reinforcement of these positive trends together with the introduction of the West of England Partnership, which helps in the coordination of development at regional scale, seem to have valued Bristol the first position in the relevant indicator at 2015 contest.

Stockholm’s urban environment fulfils the award's requirement of holding very high environmental standards and it can showcase the benefits that its privileged environment provides. However, for that very same reason, the lessons extracted from this case study in terms of development strategies to shift an unsustainable environment are limited.

Barcelona, in contrast, is an example of how a dense and compact urban form may have its problems too. And that even a highly developed environment can allow interventions for improvement. However, strategies applied in Barcelona before the time evaluated by the award

(80-90s citizen's urbanism; urban acupuncture; sponging) may be of more value than recent examples (00s business' urbanism).

6 General conclusions

The EGCA appraisal of applicant cities regarding 'Green urban areas incorporating sustainable land use' may have originally given too much weight to the urban form in detriment of the urban development strategies undertaken. The examples with highest scores in the early rounds of the award (i.e. Stockholm and Barcelona) did not show significant changes in recent development, but continuity to maintain an already privileged urban environment. In this respect, rewarding the 'greenest city' in Europe may have conflicted with the aim of providing best practice models for the transition of other European cities, at least with regards to land use.

Historical development has great influence in current urban form. This study shows that earlier case studies present more privileged urban environments, however diverse, but with some common traits in their past development.

- In Stockholm and Barcelona a **comprehensive plan** was put in practice at the time when city's expansion began, providing the city with a structure that is still valid. In Bristol, however, a disorganized process of decentralisation and a number of partially applied development plans occurred before a coherent regeneration plan and consistent structure for the whole city were implemented. Each of these historical processes have determined the inherited urban form.

- There is not a specific **inherited urban form** among the case study cities, although there are some shared characteristics. Whether it be a multi-nuclei network or just one large built-up area: compactness and a balanced mixed-use are characteristics of the urban forms in Barcelona and Stockholm. Bristol, however, shows dispersed, low-density areas with separate uses.

- In terms of **green space structure and transport system** the situation considerably differs from one case to other. Stockholm's urban form is indivisible from both transport system and green and water structure. It is the combination of the three aspects that results in a highly sustainable performance. Barcelona's sustainable transport system was implemented afterwards, although a long time ago, taking advantage of its compact and dense urban form. The green space structure in Barcelona has been, and still is, subject of constant increase through localised interventions. In Bristol the abundance of green spaces was counterbalanced with a lack of maintenance that is now being solved with the implementation of strategies to improve the quality and accessibility. The inherited dysfunctional inner city traffic network is simultaneously tackled by initiatives that focus on reducing private car traffic in favour of other means.

- In respect to recent **urban development strategies**, all three case study cities present similar strategies such as brownfield re-development and green area recovery, preservation and improvement. The strategies match those promoted by the award to prevent land uptake. All three cities are front running in this subject. However, they are differentiated by the point they have reached in the process. While Stockholm is in the point of maintenance and enhancement of an already achieved overall good balance and structure; Barcelona tries mainly to increase and improve the green space system. Bristol, somewhere earlier on in the process, works to shape a denser mixed-use environment with more accessible and better quality green spaces. Strengthening nodes and improving connectivity are also common strategies across the cities.

The EGCA's aim is to share experiences and promote the path towards urban sustainability. However, examples that show transition responses are more important to this aim than the promotion of historically high-quality environments. As a result, the cities awarded need not always have the best environment, but can be actual examples to be followed. What unsustainable cities need are examples of the process, not a showcase of ideal environments that may be too far from their reality to provide a roadmap. In this sense, Bristol may serve as

better model for transition than Stockholm or Barcelona, given that the city has undertaken and still is undertaking transition, with positive results and achievements.

Keywords

European Green Capital; land use; urban form; urban development; Bristol; Stockholm; Barcelona

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NOTE: All online resources last accessed March 2015 if not otherwise stated.