Natural capital
accounts for public
green space
in London

Report prepared for Greater London Authority,
National Trust and Heritage Lottery Fund

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Executive Summary

1 Executive Summary

1.1   Context

Londoners live in one of the greenest cities of its size in the world. They have access to an extensive network of public parks and green spaces, though this access varies locally. A greater understanding of the services and benefits that Londoners now enjoy from their public parks and green spaces will help to inform their future management.

Most of these are owned or managed by the London boroughs, other public agencies (such as The Royal Parks and Lea Valley Regional Park Authority) or environmental organisations, many of which are supported by grants or contracts from local authorities. However, with constraints on public funding, many are struggling to invest in, and maintain, public green spaces. Thus, it has become a priority to make the best use of precious resources, a public discussion which this study's findings inform.

Into this debate, the report highlights the enormous economic value and benefits provided by public parks and green spaces. It provides a compelling narrative and evidence base for maintaining, or even increasing, investment in London's public green spaces and motivates policy-makers and decision-makers to explore new sustainable models for funding or financing the provision and maintenance of public parks.

Vivid Economics was commissioned by the Greater London Authority, National Trust and Heritage Lottery Fund to estimate the economic value provided by London's public parks.

1.2   Main findings

London's public parks have a gross asset value in excess of £91 billion.

This represents 30 years of value at £5 billion a year, appropriately discounted. The value of parks reflects their general amenity, benefit to health and opportunity for exercise, and the value of recreation. Individuals, public services and businesses all benefit from public parks across the city. The composition of these benefits is shown in Table 1 by benefit type as well by beneficiary. Residents of London are the principal beneficiaries. In addition to this total value, it also helps us understand their value for money.

For each £1 spent by local authorities and their partners on public parks, Londoners enjoy at least £27 in value.

This investment is exceptional value for money, ensuring that London and Londoners benefit enormously from the city's network of public parks. With such exceptional value, it makes sense to take care of the amount and quality of parks.

The economic benefits from parks are not spread equally across or within London's boroughs.

Some parts of London benefit from having plentiful green spaces, whilst others are lacking in this important resource. This results in important inequalities of opportunities for leisure and health outcomes. Taking this into account, future investments can be targeted spatially to correct this inequality. The act of valuation helps to highlight these inequalities.

Londoners avoid £950 million per year in health costs due to public parks. Public parks create opportunities for people to exercise, socialise, relax and enjoy being part of their community.

In doing so, people improve their physical and mental health. This total avoided cost is made up of £580 million per year by being in better physical health and £370 million per year by being in better mental health. The health benefits of London's public parks amount to 20 per cent of their total economic value. In recent years, the importance of parks for health has been receiving attention, particularly for important disease classes where exercise matters, such as heart disease and diabetes. Here, the emphasis is similarly on mental health, which deserves equal attention.

The value of recreational activities is estimated to be £926 million per year.

London's public parks provide many opportunities for recreational activities that people enjoy, including sporting activities and enjoyment of natural and cultural heritage.

People enjoy the benefits of the services provided by public parks and this is reflected in the amount they are willing to pay to live close to them.

It is estimated that for the average household in London, the value of proximity to parks is over £900 per year. This is in addition to the other types of benefits households enjoy, which, as one would expect, shows that parks are not only delivering value through recreation and relieving disease but also because of its impact on general quality of life.

Public parks supply other services too, such as temperature regulation and carbon storage.

Green spaces in urban areas counter higher temperatures in summer months that can lead to ill health. Natural and semi-natural parkland also provide global benefits as a store of carbon in soil and trees. These are smaller sources of economic value compared to those described above.

TABLE 1

Summary of the sources of economic value provided by London's parks

VARIABLE	PUBLIC SERVICES (£bn)	RESIDENTS (£bn)	BUSINESSES (£bn)	TOTAL (£bn)	SHARE %
Recreation		17		17	19
Mental health	1.4	3.4	2	6.8	7
Physical health	2.1	5.5	3.1	10.7	12
Residential property		55.9		55.9	61
Carbon (soil)				0.2	0
Carbon (trees)				0.1	0
Temperature		0.6		0.6	1
Gross asset value	3.5	82.4	5.1	91.3	100
	4%	90%	6%	100%	

Note: The values are shown as present values evaluated over a period of 30 years, discounting at a rate of 3.5% per year.
Source: Vivid Economics

One fifth of the area of Greater London is designated as publicly accessible parks.

Public parks are defined as areas in Greater London that are free to enter and use. This includes local and regional parks, woodlands, sports fields and children's play areas. Other green areas, such as private gardens, farmland and private sports fields and golf courses are not included in the study. The value of public parks is estimated for each of Greater London's 33 boroughs. Policy makers and residents can access information on the value of public parks at the local level to understand where and how parks provide economic value.

All these estimates are based on a number of assumptions about the effects that urban parks have on Londoners and their preferences.

The work highlights the need for more comprehensive data on the number of people using parks, a greater understanding of the activities people engage in, and of differences in participation across socio-economic groups.

The term 'economic value' refers to some of the benefits that people enjoy.

These benefits, when represented in monetary terms, give policy makers and the public a better understanding for making decisions about park management and funding. The value of these parks is almost certainly greater than the figures reported here, since these estimates do not cover all aspects of wellbeing, nor intrinsic value.

2 Introduction

2 Introduction

2.1 The purpose of this work

Vivid Economics was commissioned by the Greater London Authority, National Trust and Heritage Lottery Fund to estimate the economic value provided by London's public parks.

The work goes beyond traditional financial accounting studies by estimating the magnitude of economic benefits that are generally not included in balance sheets. In particular, this means not simply treating London's public parks as costly liabilities for local governments and other providers. Rather, by understanding and accounting for a range of economic benefits that this resource provides, these accounts better reflect the social benefits derived. This additional, and vital, economic information can help better inform decisions about the management of, and investment in, London's public parks.

The fact that these spaces are publicly accessible means that they can be enjoyed by all.

This presents a challenge for policy makers in determining appropriate levels of investment to maintain and improve these assets. Free access means information about their use value has been absent in the past. Additionally, an understanding of the set of services that parks provide can inform decisions about how best to manage them to the benefit of local people and the economy.

This assessment of the economic value of public parks does not suggest that the intrinsic or social value of these spaces should be overlooked.

Similarly, it does not imply that the figures can be used to assess where parks can be traded off for alternative uses. This valuation is derived from studies that look at small (marginal) changes in the availability of parks. So while the loss or gain in asset value from a small change in London's parks area may be in proportion to the percentage change in area, a large reduction in park area or quality might result in a much greater than proportionate loss of asset value. For example, a 10 per cent change in park area or quality could result in a greater than 10 per cent reduction in asset value.

2.2 Scope of this study

The aim of this report is to critically assess and understand the sources of economic value of parks for London.

This is done by thoroughly reviewing appropriate methodologies and building on previous work in order to more fully understand the economic importance of parks in the city. The relative value of services is assessed, alongside an analysis of who benefits from them.

This report marks a significant step in the understanding of parks in London and also the economics of parks more generally.

This relates to two areas. The first is the use of spatial tools to understand the relationship between economic value derived from parks and measures of proximity, density or access to parks. The use of spatially explicit data and tools also allows for the assessment of park value across London. This sheds light on areas where benefits from London's parks are particularly abundant or scarce.

The second area is health. It is generally accepted that urban green spaces contribute to health. This report summarises work in this area and applies several methods to estimate the contribution of London's public parks to the health of the city's population.

2.3 Natural capital accounting

Natural capital describes those components of the natural environment (including green spaces in cities) that provides economic benefits to people provided for free; services such as cleaner air, cleaner water, better health, pollination of crops, contact with nature and attractive landscapes.

The maintenance of natural capital is critical for the provision of certain services (TEEB, 2010).

Natural capital accounting provides the framework to assess the economic value of London's parks. Natural capital refers to the set of 'environmental assets that may provide benefits to humanity'(ONS/Defra, 2017, p5). Accounting for these natural assets means measuring their physical quantity or quality and quantifying the flow of services that these assets provide. Natural capital accounting is increasingly undertaken at national and sub-national levels as a way of representing the value of ecosystem services alongside more traditional economic statistics. The method proceeds in two steps. The first step assesses the ecosystem services supplied by the stock of natural capital and outlines the set of beneficiaries from these services. The second step estimates the value of those services.

2.4 Previous work in the area

There is great interest in the role that urban green spaces play in the lives of populations around the globe.

Much of this work is driven by a growing body of evidence that links the existence of urban park to favourable economic and environmental outcomes. Literature reviews of various studies that have examined these effects can be found in Konijnendijk et al., (2013), Saraev (2012) and Tempesta (2015).

A small number of studies have sought to quantify the economic contribution of urban parks by estimating in monetary terms the benefits from services.

One of these studies was undertaken to understand the role of city parks in Philadelphia, USA, for example (Philadelphia Parks Alliance, 2008). In Philadelphia, the value far outweighs the cost of maintaining the parks, with nearly $100 generated in economic value for every $1 spent on maintenance. A key finding is that the majority of value generated accrues to residents. In particular, free access to parks provides residents with cheap recreational opportunities and health benefits, which in turn are estimated to be reflected in the value of residential property.

In the UK, the economic value of urban parks has also been estimated in Sheffield (Vivid Economics, 2016). In Sheffield, for every £1 spent on maintaining the parks, £34 of benefits are generated. As with the Philadelphia study, residents enjoy a large share of the benefits, with 97 per cent of total value accruing to them. The study estimated substantial health benefits, using evidence that physical and mental health are linked to access to parks, it found that physical and mental health savings made up 46 and 12 per cent of total economic value, respectively.

In Edinburgh, parks have been rated in terms of 'social return on investment', which uses visitor and stakeholder data from a sample of the city's parks to estimate monetary values (City of Edinburgh Council, 2014). This work concluded that £1 spent on parks is associated with wider social returns of £12. Holzinger & Sadler (2015) estimate the value of natural capital for Birmingham and conclude that these assets provide a net benefit to society of £380 million.

In summary, there is strong and consistent evidence of substantial economic values from urban parks.

2.5 Structure of the report

The rest of the report is structured as follows:

- **Section 3** describes London's public parks;

- **Section 4** shows the results and discusses the findings;

- **Section 5** draws conclusions;

- **Appendix 1** summarises the economic value of parks for each borough;

- **Appendices 2 and 3** record the methods used to estimate values.

3

London's
Public
Parks

3 London's Public Parks

3.1 Defining public green space

In this study, public parks are areas such as local and regional parks, publicly owned woodlands and natural areas that are freely accessible to Londoners.

Data on the location and categorisation of these areas is taken from the database maintained by Greenspace Information for Greater London CIC. The categories of public parks are shown in Table 2.

TABLE 2

Park types are varied and dominated by parks and natural and semi-natural spaces

TYPE OF GREEN SPACE	AREA (hectares)	PROPORTION %
Parks and formal gardens	9,200	29
Natural and semi-natural urban park	8,500	27
Amenity	6,600	21
Outdoor sports facilities	6,200	20
Allotments and community gardens	1,000	3
Total	31,000	100%

Source: Vivid Economics and Greenspace Information for Greater London CIC

Parks make up the largest area of public green space in London.

Examples of these spaces include the Royal Parks and a multitude of smaller parks, gardens, and squares that can be freely accessed. Natural and semi-natural urban parks represent the second largest category. These spaces represent naturally diverse spaces including country parks, commons, woodlands, and nature reserves. Amenity spaces refer to areas of green space such as village greens and grassy areas used for a variety of informal and formal recreation. Smaller categories of green space in London are allotments and community gardens, as well as play areas primarily used by children.

A number of green or other public spaces are excluded from the definition of public parks used in this study.

There are three reasons for this. Firstly, interest is confined to green areas in London and for this study we have chosen to exclude canals and rivers. Secondly, some green areas in London are not freely accessible to the public because they are only available for private use or are funded by charging access fees. These include private gardens, agricultural land and sports facilities, such as golf courses. Thirdly, the contribution to access, recreation and health derived from some green spaces, is expected to make an insignificant contribution in comparison with the core network of public parks. This is the case for categories such as landscaped areas around commercial buildings.

Public parks in London used in this study are mapped in Figure 1. This shows the large amount of publicly accessible parkland available in the city. Examples of these spaces range from the large expanses of Richmond Park, Lee Valley Regional Park and Hampstead Heath, through to the smaller parks, squares and amenity spaces that are scattered throughout Greater London.

FIGURE 1

Areas defined as publicly accessible green space in Greater London

0   2   4   8   12   16
                                    Miles

Source: Vivid Economics, London Datastore and Greenspace Information for Greater London CIC

For the whole of Greater London, the average density of public parks is 20 per cent.

This figure varies across the city's 33 local authorities, made up of 32 boroughs and the City of London Corporation. Table 3 shows the percentage of each local authority that is devoted to public parks, ranked in descending order. Richmond has the highest proportion at 40 per cent, while the City of London and Newham contain the least, with five and eight per cent respectively. Accordingly, the report presents valuation estimates at the London level and also at the local authority level, reflecting this diversity.

TABLE 3

The distribution of public green space across London's boroughs

BOROUGH	TOTAL AREA (hectares)	PARK AREA (hectares)	PERCENTAGE %
Richmond upon Thames	5,900	2,400	41
Merton	3,800	1,100	29
Hounslow	5,700	1,600	28
Hackney	1,900	500	26
Waltham Forest	3,900	1,000	26
Greenwich	5,000	1,200	24
Croydon	8,600	1,900	22
Redbridge	5,600	1,200	21
Enfield	8,200	1,700	21
Harrow	5,000	1,000	20
Barnet	8,700	1,700	20
Camden	2,200	400	18
Wandsworth	3,500	700	20
Westminster	2,200	400	18
Ealing	5,600	1,100	20
Haringey	3,000	500	17
Bexley	6,400	1,200	19
Havering	11,400	2,100	18
Barking and Dagenham	3,800	700	18
Bromley	15,000	2,600	17
Sutton	4,400	700	16
Hillingdon	11,600	1,800	16
Lambeth	2,700	400	15
Lewisham	3,500	500	14
Brent	4,300	600	14
Kingston upon Thames	3,700	500	14
Kensington and Chelsea	1,200	200	17
Hammersmith and Fulham	1,700	200	12
Tower Hamlets	2,200	300	14
Southwark	3,000	400	13
Islington	1,500	200	13
Newham	3,900	300	8
City of London	300	20	7
Total	160,000	31,000	20

Source: Vivid Economics and Greenspace Information for Greater London CIC

4
Key
Results

4 Key Results

This section presents estimates of economic value. It discusses the value of each service separately before aggregating them into a natural capital account for London. The results from sensitivity analysis and a discussion of data quality follow.

4.1 Health

Urban green space is increasingly recognised as enabling city residents to live healthier and happier lives (World Health Organization, 2016).

Parks and other green spaces create opportunities to relax, exercise and experience natural surroundings. This work estimates value from the services to mental and physical health, both of which have been linked to access to parks. For both, the first step gathers evidence on the contribution parks play in affecting health outcomes. The second step estimates the avoided costs of ill health due to London's parks.

The total value of avoided healthcare costs due to London's greenspace is estimated at £950 million per year.

This is made up of reduced disease risk due to higher levels of physical activity and improved mental health due to access to parks.

4.1.1   Physical health

Physical inactivity is one of the leading causes of adverse health outcomes, representing the fourth largest risk factor for mortality globally (World Health Organization, 2010).

In the UK, physical inactivity is known to increase the risk of five major diseases, notably cardiovascular disease, diabetes, obesity, colon cancer and breast cancer (Chief Medical Officers, 2011). Urban parks provide opportunities for city residents to increase levels of physical activity in spaces where exercise and recreation can be conducted free of charge.

This study estimates that the annual costs to physical health for five disease types are reduced by £582 million per year in London due to the existence of the city's parks.

This equates to savings of £67 per person in London. Compared with the economic costs of disease, it is estimated that avoided costs due to parks in London total 7 per cent of the economic costs of physical inactivity in London.

The estimates presented here are based on several sources of data. The first is the link between access to parks and physical activity. Here it is assumed that for populations with access to a park, the probability of being physically inactive is 20 per cent lower (Bird, 2004). The avoided costs of physical activity for the five major disease groups are then estimated using data on the economic costs of each disease (British Heart Foundation, 2013; Niles, 2007).

TABLE 4

Value of parks for physical health in London

PHYSICAL HEALTH	VALUE
Benefits	£580m/yr
Estimated costs of physical inactivity	£8.5bn/yr
Benefit from parks as a proportion of total cost	7%
Per person benefit (persons of all ages)	£67/head/yr

Source: Vivid Economics

4.1.2   Mental health

London's parks are estimated to avoid £370 million of costs incurred each year as a result of mental ill-health, as shown in Table 5.

On a per person basis, this is £42 per year. This contribution reduces the total mental health burden by 2 per cent.

The relationship between mental health outcomes and availability of green space are derived from White, Alcock, Wheeler, & Depledge (2013), who studied how the density of green space in urban areas across England affects self-reported mental health of individuals. Avoided costs are calculated using estimates of the cost of mental illness across England (Centre for Mental Health, 2010).

TABLE 5

Value of parks for mental health in London

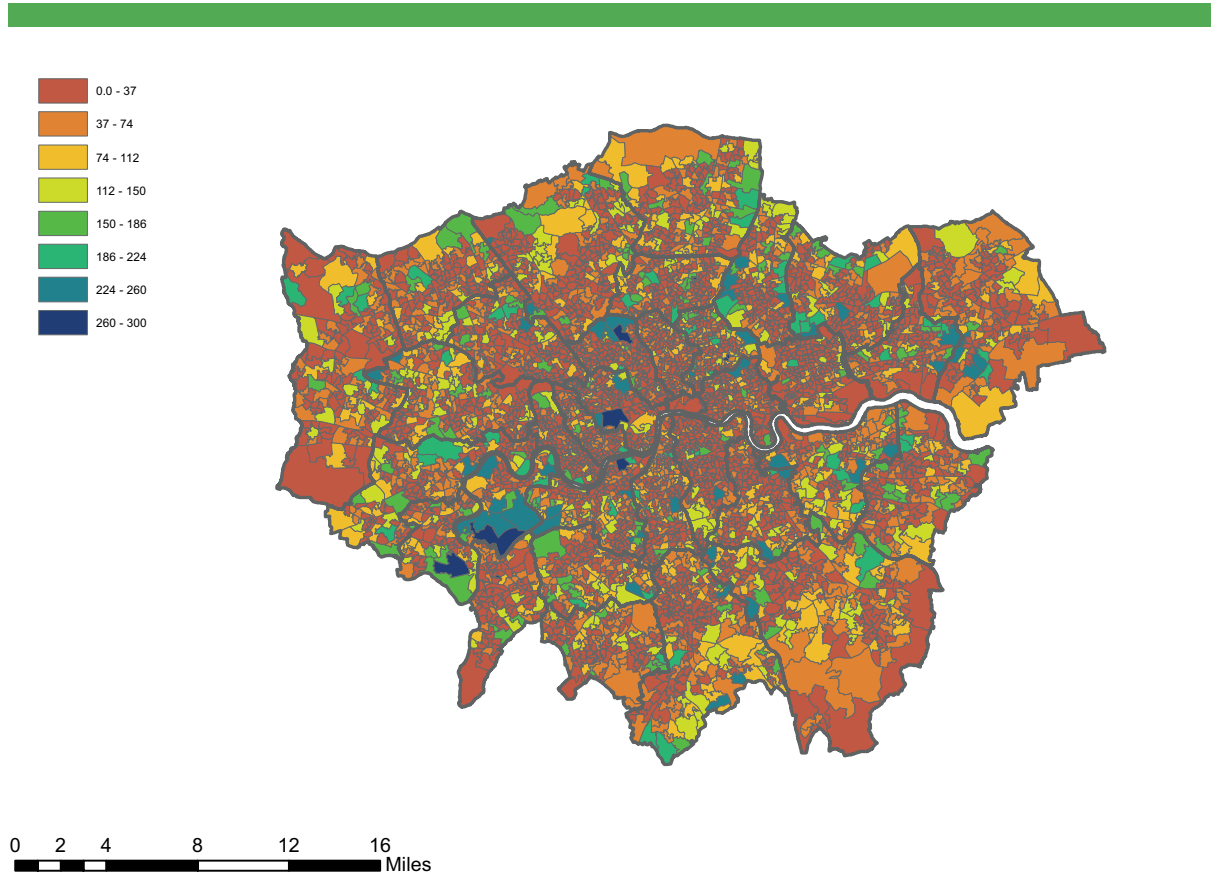| CATEGORY	VALUE
Benefits	£370m/yr
Estimated costs of mental ill health	£17bn/yr
Per person benefit (persons of all ages)	£42/head/yr

Source: Vivid Economics

The mental health benefits of parks are unevenly distributed across the city.

Figure 2 shows how these costs vary across the 4,836 Lower Super Output Areas (LSOAs) in Greater London. Localities where the density of green space is highest benefit most in terms of mental health savings. This is particularly apparent in areas near large parks and in many suburbs. In contrast, there exist areas that see little benefit from public parks. This is particularly apparent in parts of Central London, shown in red in Figure 2, highlighting the challenge of providing sufficient public green space in the most densely developed areas of the city.

FIGURE 2

Avoided mental health costs (£ per person)

■	0.0 - 37
■	37 - 74
■	74 - 112
■	112 - 150
■	150 - 186
■	186 - 224
■	224 - 260
■	260 - 300

0 2 4   8   12   16
                        Miles

Source: Vivid Economics, London Datastore and White et al. (2013)

4.2 Other benefits of access to park services

People generally like to be close to public parks because of the benefit of having access to open space for socialising, outdoor play, being close to nature, dog-walking etc. In order to estimate the value of this benefit of public parks, this report utilises the relationship between house prices and access to local green space in London.

House prices reflect a buyer's preference over certain amenities. For instance, buyers show preferences for locations close to transport or in areas with lower crime rates. Accordingly, buyers will pay more to reside where more of these favourable characteristics exist. Proximity to green space has been shown by a number of studies to positively affect the value of house prices, showing that households value a range of amenities provided by parks (Brander & Koetse, 2011; Gibbons, Mourato, & Resende, 2014).

This report estimates that the value of these services to people amounts to £410 per person per year.

For the average household in London, the annual value is £930 per household per year.

The possibility of double counting park value is addressed by subtracting estimates of health value from the value derived from property prices.

This addresses the concern that residents may already take into account health benefits in their valuation of housing; this conservative approach avoids overestimation due to double counting, but may lead to an underestimate.

Data on average house prices within each LSOA in London is used for the year 2014 (London Datastore, 2016). The effect that proximity to green space has on house prices has been estimated by Smith (2010). This study finds that for each hectare of green space located within a 1 kilometre radius, average house prices are 0.08 per cent higher in London.

TABLE 6

Value of parks for amenity services

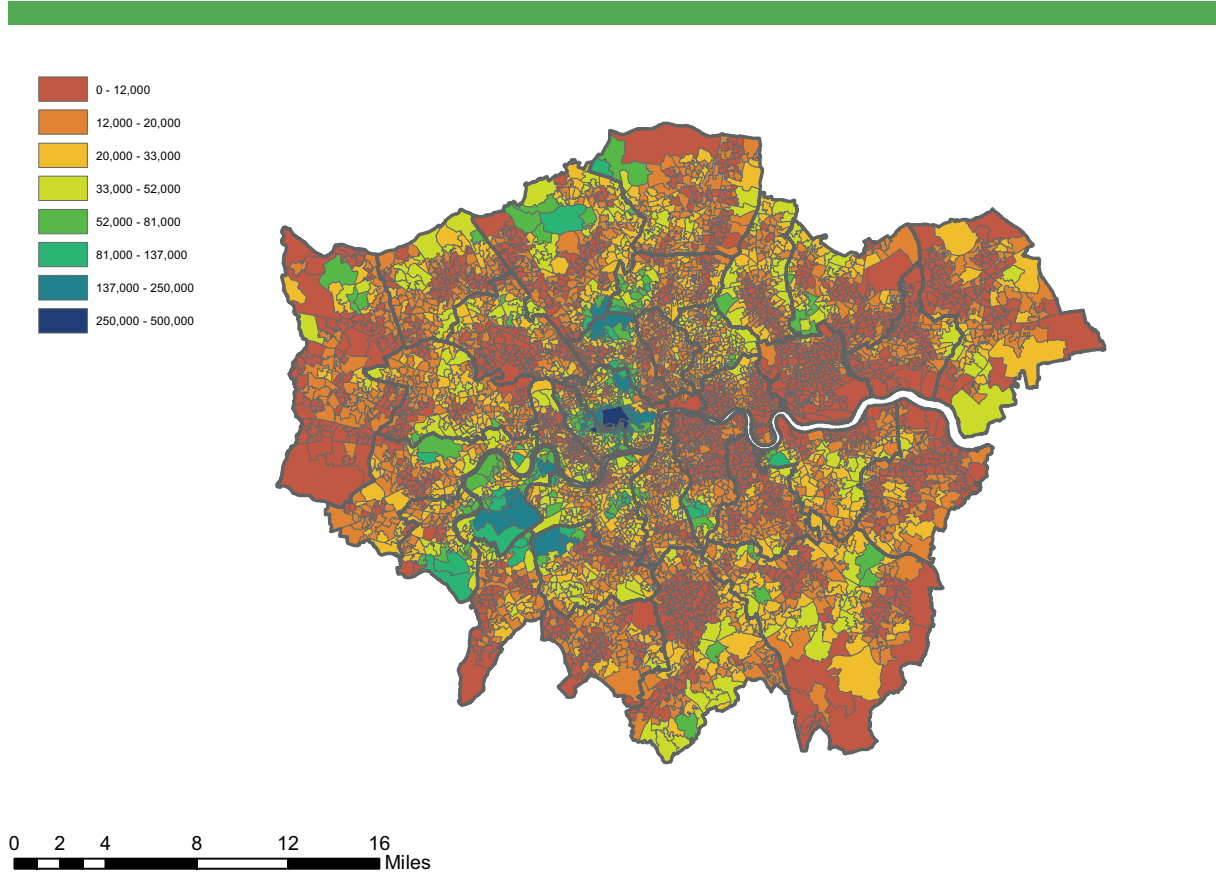| ITEM	VALUE
Total property uplift	£64bn
Total value of residential property in London	£1.6tn
Uplift as a proportion of total property value	3.4%
Number of dwellings	3,300,000
Per dwelling uplift	£17,000
Per dwelling uplift (annualised)	£930
Per person uplift (occupancy rate of 2.2, 3.5% discount rate over 30 years)	£410/yr

Source: Vivid Economics

Based on the relationship between property prices and proximity to parks, the amenity value from London's public parks can be estimated spatially across the city.

This is shown in Figure 3. Here it can be seen that a number of areas close to the centre of London, such as around Hyde Park and Regents Park have very high valuations per household. This is also apparent for the large green spaces of Richmond Park and Hampstead Heath.

FIGURE 3

Value of parks on property prices in London (£ per household)

|	
■	0 - 12,000
■	12,000 - 20,000
■	20,000 - 33,000
■	33,000 - 52,000
■	52,000 - 81,000
■	81,000 - 137,000
■	137,000 - 250,000
■	250,000 - 500,000

0 2 4   8   12   16
Miles

Source: Vivid Economics, London Datastore and Smith (2010)

The predicted value of park services revealed through property prices are positively related to income in London.

LSOAs where median incomes are higher, have a higher estimated value of parks services, see Figure 4. People with higher incomes can afford to live in areas with better access to parks which might mean that those on higher incomes receive a higher share of the services from parks in London.

FIGURE 4

Parks are valued more by households in higher income areas
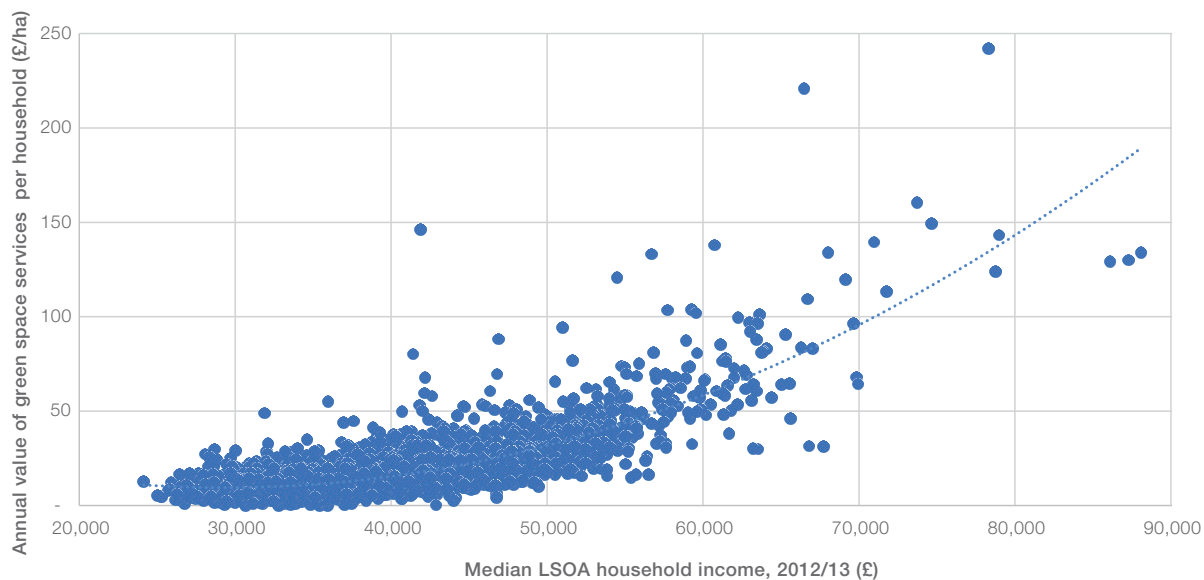
Source: Vivid Economics, London Datastore and Smith (2010)

4.3 Recreation

Recreation in parks is valued at £17 billion pounds for London, which translates into an annual economic benefit of £930 million.

As is shown in Table 7, if this value is divided by the population of the city, this suggests that the average London resident benefits to the tune of £120 per year. The value of recreation for parks in London is estimated using the Outdoor Recreation Valuation (ORVal) tool (Day & Smith, 2016). This tool estimates the economic value people are willing to pay to use a particular park for recreational activities, based on the cost of travel to visit.

TABLE 7

The value of recreation in London

RECREATION	VALUE
Total annual benefit	£930m/yr
Per person benefit (persons of all ages)	£120/head/yr

Source: Vivid Economics and Day & Smith (2016)

4.4 Carbon storage

Parks store carbon dioxide in the growth of trees and organic matter in soil.

The carbon contained in London's parks is estimated in two ways. The first sums the total wooded area in London. The physical stock of carbon contained in each hectare of woodland is then estimated using figures from the Forestry Commission (Forestry Commission, 2011). Second, the carbon stored in trees themselves is estimated using the number of trees from the London iTree Eco Project (Rogers, Sacre, Goodenough, & Doick, 2015). Monetary values of carbon dioxide are taken from UK government figures, which place a value of £63 per tonne on non-traded carbon dioxide (Department for Business, Energy & Industrial Strategy, 2017).

For the whole of Greater London, the value of carbon stored in soil is estimated to be £10 million per year and the value of carbon contained in trees is estimated at £8 million per year.

TABLE 8

The value of carbon storage in London

CARBON SEQUESTRATION	VALUE
Physical stock of carbon in soil	2.3 million tonnes
Economic value of carbon in soil	£10 million/yr
Physical stock of carbon in trees	3.1 million tonnes
Economic value of carbon in trees	£8 million/yr

Source: Vivid Economics

4.5 Temperature regulation

Urban areas experience higher average temperatures than surrounding areas because they absorb heat more readily, use more energy and have lower ventilation (Met Office, 2012).

Green areas within cities play a role in regulating this effect and they reduce the burden of heat stress during periods of elevated temperature.

The overall contribution of London's parks is estimated to be £594 million.

This figure is estimated by Doick & Hutchings (2013) who assume that the overall contribution of London's green spaces reduces urban temperatures by 2°C during heat waves. The economic value of cooling is based on the number of lives saved due to cooler peak temperatures, which is monetised through the value of avoiding premature death.

4.6 Total value

The total economic value of services provided by London's public parks and green spaces is valued at £91 billion, as shown in Table 9.

The table shows the present value of park services, which is estimated over a period of 30 years and is discounted at a rate of 3.5 per cent per year (HM Treasury, 2008).

A comparison of the value of economic benefits of parks compared to the costs yields a benefit-cost ratio of 27:1.

Table 9 shows how these values are split between various groups and the share of each service in the total valuation.

The largest share of value is the amenity value of living close to public parks, estimated at £56 billion pounds. Both healthcare and recreation each make up around 19 per cent of the rest of the total value. For health, the services of parks are valued at £11 billion for physical health and £7 billion for mental health. For the recreational value of London's parks, the figure is £17 billion.

A small share of total value is contributed by the role that parks play as regulating services, both as sources of local temperature regulation and carbon dioxide storage.

It is estimated that temperature reduction in London due to parks provide £594 million of value. Additionally, carbon dioxide sequestered is worth £340 million.

Individuals receive 90 per cent of the benefits from parks directly.

Individuals receive amenity services directly, expressed in house prices. Indirect benefits are received via employment, firm dividends and government expenditure savings. The share of value falling to broad groups of beneficiaries in terms of economic value from London's parks is shown in Table 9. Parks create significant value for the public sector, through avoided healthcare expenditure, and for businesses through increased productivity and lower worker absence.

TABLE 9

London parks natural capital account (£ billion)

ASSETS/ LIABILITIES	BOROUGH	PUBLIC SERVICES	HOUSEHOLDS	BUSINESSES	GLOBAL	VALUE	%
ASSETS							
Physical health		2.1	5.5	3.1		10.7	12
Mental health		1.4	3.4	2		6.8	7
Residential property			55.9			55.9	61
Recreation			17			17	19
Carbon sequestration (soil)					0.2	0.2	0
Carbon sequestration (trees)					0.1	0.1	0
Temperature			0.6			0.6	1
Gross asset value	0	3.5	82.4	5.1	0.3	91.3	100
LIABILITIES							
Operational expenditure	(3.3)					(3.3)	
Total liabilities	(3.3)					(3.3)	
NET VALUE							
Net asset value	(3.3)	3.5	82.4	5.1	0.3	88	
% of net value	(4%)	4%	94%	6%	0%	100%	

Note: All figures are shown in present value terms evaluated over a 30 year time period and using a 3.5 per cent discount rate. Figures shown in brackets refer to liabilities.
Source: Vivid Economics

4.7 Comparing benefits and costs

There is a positive relationship between current local authority spending per hectare of public park and value derived.

This relationship is shown in Figure 5. Boroughs in central London tend to be those that spend the most per unit and also derive highest economic value. This is particularly true for Islington and Kensington and Chelsea.

Boroughs with more public parks tend to derive lower benefits per hectare but spend less on maintaining these spaces.

This can be seen in Figure 5 where the size of the bubble is proportional to the total area of public parks in a borough. Most of the boroughs where this is true are located in Outer London.

Possible explanations for this relationship are:

- economies of scale in park spending for boroughs: high fixed costs of maintaining parks may mean that boroughs with more parks are able to manage these spaces at lower costs per unit of parkland;

- natural spaces are cheaper to maintain: larger parks are also likely to be natural spaces, which are cheaper to maintain than smaller, more cultivated spaces;

- expenditure correlates with borough income: boroughs that collect higher receipts may spend more on parks;

- parks become less valuable when there are more substitute sites, such as other parks nearby that are similar in type and quality.

FIGURE 5

Value and expenditure on parks are positively related across London's boroughs
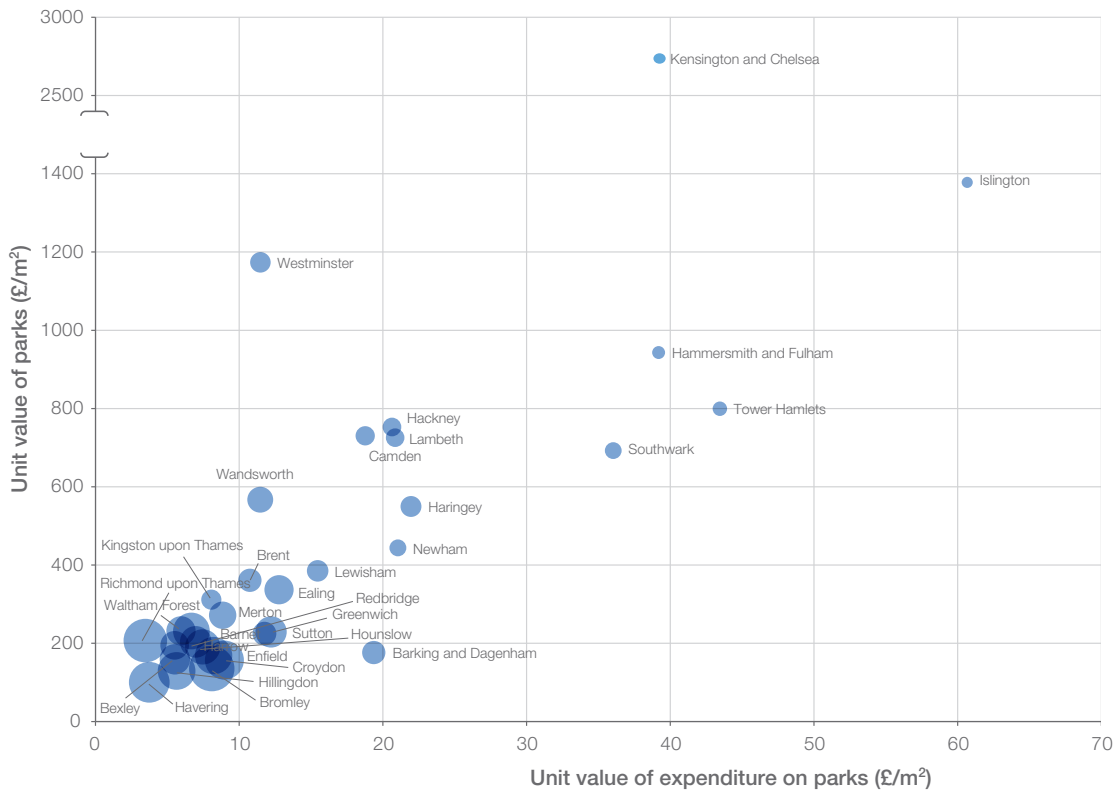
Note: The City of London is excluded from this figure. This is due to expenditure data for the City of London including the amount spent on parks that are owned outside of the boundary of the local authority. Bubble size is proportional to the area of parks in a borough.
Source: Vivid Economics

4.8 Sensitivity analysis

The value of public parks is subject to some uncertainty.

A number of these uncertainties relate to assumptions about the population that is assumed to have access or benefit from being located near to a park. Table 10 shows the effect that variability in these assumptions has on the overall economic valuation of parks in London. Under the lower scenario, where the most conservative assumptions are made about the population benefiting from parks, the benefit to cost ratio of park expenditure reduces to 14. In contrast, under more optimistic assumptions about the benefits from parks, this ratio increases to 34.

TABLE 10

Sensitivity of total value of London parks to alternative scenarios

	LOWER	CENTRAL	UPPER
Total net value (£ billion)	43	91	110
Benefit cost ratio	14	27	34

Source: Vivid Economics

To understand how important these assumptions are for the estimated value of public parks in London, sensitivity analysis is performed on amenity (property), mental health and physical health estimates. Figure 6 compares the upper and lower bounds for each category with the value that is used in the main analysis (shown in yellow). This shows that the value of parks revealed through residential property purchasing decisions shows considerable variability and has significant bearing on the magnitude of the overall valuation. For mental and physical health, there is lower variability in the value attributed to parks.

FIGURE 6

Values for health and other park services are subject to uncertainty
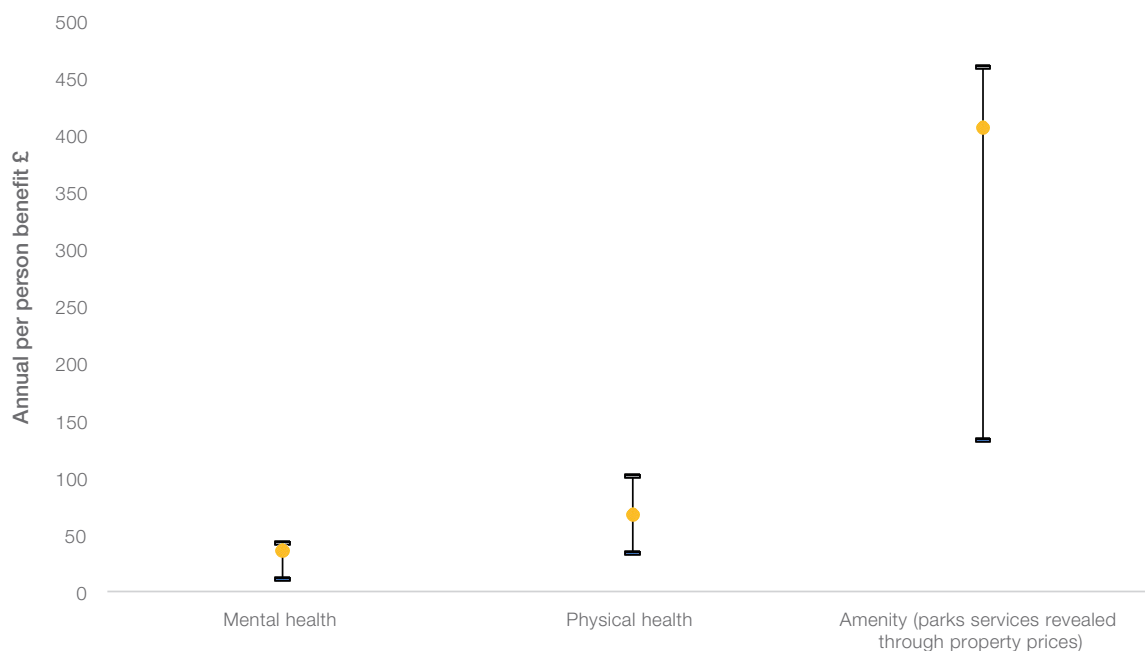
Source: Vivid Economics

4.9 Data quality assessment

The relationship between property value and parks has previously been well studied owing to data availability on house prices, whereas other benefit categories are more uncertain owing to lower data quality.

Figure 7 presents an overview of the confidence placed in the quality of the data and relationships used to estimate the economic value of parks in London. Each value category is assessed according to confidence in the overall quality of the relationship and how prominently each benefit category features in the accounts total value. Higher confidence is also placed on the services provided from carbon storage, given that the storage capacity of soil and vegetation are measurable. The value is of this service does not feature prominently in total value, however.

There are key uncertainties in the relationship between health and parks.

First, the exact dose-response relationship between health outcomes and parks is hard to estimate owing to the absence of studies observing activity levels for individuals with different levels of access to parks. Second, the exact mechanism through which individuals experience improved health is not clear. For mental health it is unclear whether individuals benefit primarily through benefits derived from aesthetic qualities provided by parks or due to increased recreation opportunities. For physical health, a key uncertainty surrounds the exact relationship between better access to parks and improvements in physical activity.

The relationship between parks and air quality is judged to be too uncertain to include in this study.

It has previously been cited as an economic benefit of city parks and the Centre for Ecology and Hydrology is currently working on new, improved estimates.

FIGURE 7

Data quality assessment
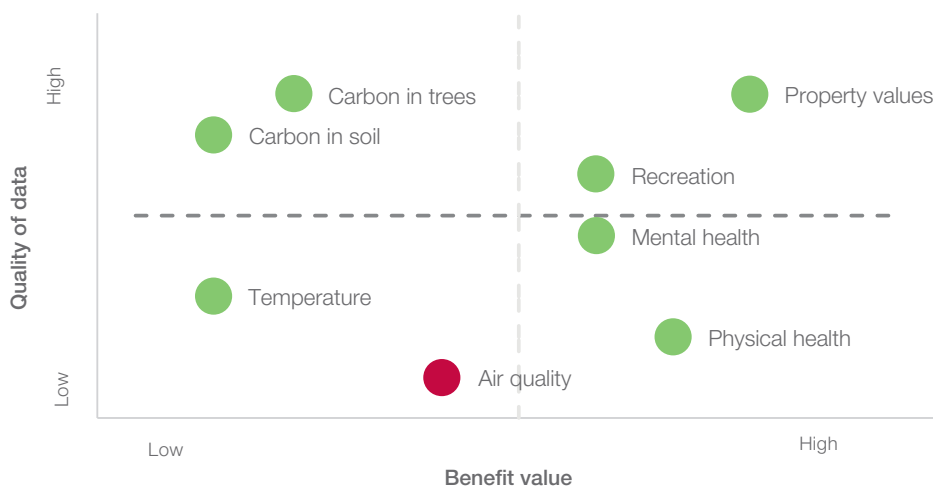
Source: Vivid Economics

4.10 Limitations and areas for future work

There are a number of limitations and caveats for the values estimated in this report.

In general, these relate to the quality of data available or quantitative understanding of the link between parks and welfare. The uncertainties over the assumptions made in this report have been stated and subject to sensitivity checks, which revealed upper and lower bounds on total park valuation and the contribution of different types of values to this total. Future understanding of the economic value of urban parks would benefit from increased understanding of the users of these parks to validate how well these observations match assumptions made in valuation studies.

The economic values estimated in this study are primarily those related to local populations in proximity to parks.

In making these assumptions, it is likely that substantial value is derived from visitors from outside of London or from residents within London who travel around the city to visit and use parks. For instance, a survey carried out for visitors to Royal Parks found that while 54 per cent of its park users resided in London, 17 and 24 per cent visited from the rest of the UK and abroad respectively (Royal Parks, 2015). The economic value of parks in this report may represent an underestimate given the value enjoyed by visitors from outside London.

Scientific uncertainty is also a significant caveat and highlights significant scope for future work.

For health this owes to the reliance of previous studies on self-reported evaluations of mental and physical wellbeing. The challenge of gaining a causal understanding of the relationship between urban parks and health remains significant, but there is great potential for the evidence base to be improved.

Another limitation of this study relates to the nature of data available on parks in London, which does not reveal the quality of these spaces.

For instance, it would be reasonable to assume that well-maintained parks would be valued more by users. It is not, however, possible in this work to assess the importance or magnitude of this effect. This type of data may be important for the future management of parks in urban areas, given that increasing population density may make it less feasible to build new public parks. Thus, improving the quality of existing green and street spaces may be the best way to improve the welfare of city residents.

5

Conclusions

5 Conclusions

5.1 Summary of main findings

This report sets out the economic value of services from London's extensive network of public parks.

In total, publicly accessible parks have an estimated value of £5 billion per year. When compared with the amount spent on maintaining the city's parks, this means that £27 of value exists for each £1 spent on maintaining parks.

Most of this value benefits individuals who are residents.

Table 11 shows that 90 per cent of park benefits in London accrue primarily to households. Businesses and public services, such as healthcare providers, also benefit from the existence of London's parks. In contrast, costs are incurred by local authorities who pay to maintain public parks.

TABLE 11

Park benefits mainly accrue to households but are costly for local authorities

ASSETS/ LIABILITIES	BOROUGH	PUBLIC SERVICES	HOUSEHOLDS	BUSINESSES	GLOBAL	VALUE
Net asset value	(3)	3	82	5	<1	88
% of net value	(4%)	4%	90%	6%	<1%	100%

Note: All figures are shown in present value terms evaluated over a 30 year time period and using a 3.5 per cent discount rate. Figures shown in brackets refer to liabilities.
Source: Vivid Economics

The health effects of London's parks are important and make up around 20 per cent of total economic benefits.

This is driven by two factors. First, there is increasing global focus on the role that urban green space plays in public health, given the majority of the world's population now lives in urban environments (United Nations, 2014). Second, the improvement in wellbeing, healthcare savings and business productivity benefits are substantial.

Amenity values of parks reflected in property prices and recreation are other important sources of economic value.

Table 12 shows that individuals value their neighbourhood environment and the opportunities for recreation provided by parks.

TABLE 12

Health, property amenity values and recreation are the primary sources of park value

PARK BENEFIT TYPE	VALUE (£ billion)	%
Physical health	11	12
Mental health	7	7
Residential property amenity	56	61
Recreation	17	19
Others	1	1
Gross asset value	91	100

Note: All figures are shown in present value terms evaluated over a 30 year time period and using a 3.5 per cent discount rate.
Source: Vivid Economics

Value varies across the city.

Not only is this apparent across but also within boroughs. Policy makers and stakeholders at various levels of government in London may use this information to further enhance the cost-effectiveness of park spending and investment across the city. Some of these policy options are discussed in the next section.

This valuation is derived from studies which look at small (marginal) changes in the availability of parks.

The correct way to interpret the asset valuation is as follows. The loss (gain) in the asset value from a small change in park area across the city is in proportion to the percentage change in area. A large reduction in park area or quality, for example, greater than 10 per cent, might result in a much greater than proportionate loss of asset value.

5.2 Policy implications

5.2.1 Spending and raising money

Expenditure on parks in the UK has not increased in recent years.

A recently published House of Commons report into the state of public parks in the UK notes that overall park budgets have fallen across the UK (Communities and Local Government Committee, 2017). Indeed, it has been estimated that 92 per cent of park managers have been subject to reduced budgets over the past three years and expect this trend to continue in future years (Heritage Lottery Fund, 2016). Given the range of economic values that are estimated for parks in London, future reductions in spending may reduce the value that these parks provide.

A solution to this may involve more innovative thinking on sources of park funding based on the primary benefits from parks.

Stakeholder discussions have highlighted an example of such a scheme in a recent proposal by Newcastle City Council to use money from its public health budget to improve the city's parks for health outcomes. Given that public parks currently benefit the health of London's population by close to £1 billion per year, such a scheme could yield real economic benefits for Londoners and public health providers.

A large share of the value of services from parks is apparent in residential property, indicating the value people place on services provided from living near a park.

Charging residents who are willing to pay a premium to live near a park a little more to fund the upkeep of the park is a possible funding mechanism. The establishment of 'Green Benefit Districts' in San Francisco is a case study on how to charge households who are beneficiaries of parks a small premium, based on their proximity to local parks (Policy Exchange, 2014).

5.2.2 Distributional issues

Data on the spatial location of parks across London means that it is possible to estimate areas of the city that benefit the most and the least from parks.

The available data and evidence allows for consideration of the importance of public parks on mental and physical health outcomes. These findings can be used to highlight both areas of concern but also opportunities to better manage London's parks.

Identifying areas that currently benefit least from the services provided by parks could be useful in prioritising investment either in additional parks, or where substitute investments could be made, or where substitute health interventions may be necessary because public parks are not available. For instance, park and health funding could both be targeted where green space deprivation is highest. Since populations in deprived areas may be less able to afford substitutes for green space, investments targeting these areas may deliver the largest gains to London's population. In many cases, there may be an absence of possibilities to construct new parks, which calls for innovative strategies to increase access to existing spaces, green the street landscape, or fund substitutes for parks.

5.2.3 Ongoing assessment

The effective management of London's parks in the future depends on how well the services of parks are understood by those who manage and fund these spaces.

One aspect of this relates to the lack of reliable data on patronage and activity of visitors to parks across the city. This information could be used to improve the management of parks in two ways. First, understanding whether park use varies significantly across socioeconomic groups can help the targeting of investments in parks tailored to the needs of local populations by interventions which encourage positive attitudes towards public parks by groups who do not currently benefit from parks. Sport England is commencing multi-year studies on the effectiveness of some of these interventions. Secondly, these data are key inputs to research on the relationships between park use and socio-economic outcomes. For instance, information about individual use patterns could improve understanding of how and why people benefit in terms of improvements in mental health.

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