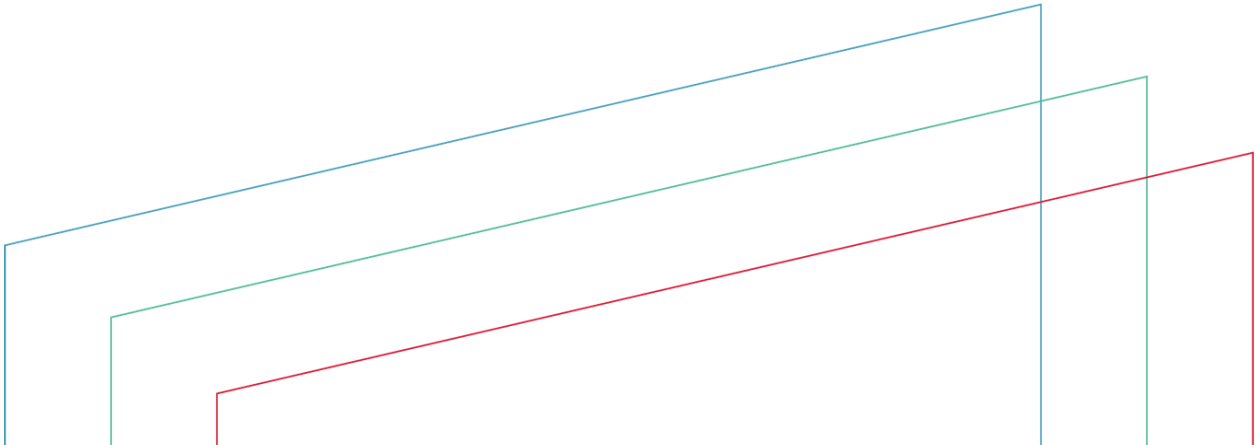
INTRODUCING A SOUTH HAMPSHIRE GREEN BELT

Exploring the socioeconomic and environmental value

New Economics Foundation



Introducing a South Hampshire Green Belt

Exploring the socioeconomic and environmental value

Published June 2020

Authors: William Davies, Jasmeet Phagoora
Client: CPRE Hampshire, The Countryside Charity

The consultancy of the New Economics Foundation, NEF Consulting helps put new economics into practice with people and the planet at the heart of decision-making.

The New Economics Foundation is the UK's leading think tank promoting social, economic, and environmental justice to transform the economy so that it works for people and the planet.

NEF Consulting Limited
New Economics Foundation
10 Salamanca Place, London SE1 7HB
www.nefconsulting.com
Tel: 020 7820 6300

CONTENTS

EXECUTIVE SUMMARY 5
INTRODUCTION 7
What is a Green Belt and why is it important? 8
The Hampshire context 9
METHODOLOGY 11
Outcome identification 11
Population 11
Valuation approaches 12
HEALTH AND WELLBEING IMPACTS 13
Defining wellbeing 13
Relationship between health and wellbeing, and green space 13
Improved emotional wellbeing 13
Improved social wellbeing and community cohesion 14
Improved physical health 14
Valuing the benefits 15
Assumptions 15
Limitations 16
Improved physical health – savings to the state 17
Wellbeing from recreational activities 19
Wellbeing from living in a green space 21
Limitations 22
ECONOMIC ACTIVITY- RECREATION AND TOURISM 25
Activities in the Green Belt 25
Effects on local businesses 25
Valuing benefits 25
Assumptions 26
Limitations 26
Estimated spend per activity 26
Total estimated expenditure 28
ECOSYSTEM SERVICES 30
Provisioning services 32
Regulating services 32
Cultural services 33

Ecosystem service estimations 34
CONCLUSION 36
Endnotes 37

EXECUTIVE SUMMARY

South Hampshire has experienced considerable urban development over the last 60 years, with local planning authorities in Hampshire considering the expansion of the urban footprint into undeveloped green field land. CPRE Hampshire, the countryside charity, has set out a planning case for the designation of a new Green Belt for South Hampshire[1] as part of a wider strategic vision for Hampshire. They commissioned NEF Consulting to undertake research exploring the types of value that a Green Belt provides. This research considers three different aspects of value associated with the proposed Green Belt:

1. Health and wellbeing benefits.
2. Economic activity associated with recreation and tourism.
3. The value of a selection of ecosystem services.

For each aspect, this study sought to value what is 'there' and at risk of being lost if this countryside is developed. All models, assumptions, and proxies used in estimations are taken from either academic literature or other credible sources.

- For **health and wellbeing**, we explored the net decrease in value if green space is urbanised by developing a simple model based on differences in physical activity and wellbeing levels for the greenest areas and the most built-up.
- For **tourism and recreational activity**, estimates on leisure activity expenditure as well as visitor frequency were the basis for exploring economic activity as a result of the proposed Green Belt.
- For **ecosystem services**, using references taken from the UK Government's natural capital guidance combined with land use data taken from the CORINE Land Cover (CLC) 2018 database, we developed a simple model to estimate the annual ecosystem service value of the proposed Green Belt.

Key findings include:

- The value of wellbeing for the population living in the Green Belt is estimated between £5 million and £6.8 million greater per year than in an alternative scenario where the proposed Green Belt is replaced by urban development. This value relates to the potential wellbeing loss if the whole Green Belt is urbanised and should be proportionately adjusted to the scale of the proposed urban developments in the area. When including the people that are on the periphery of the proposed Green Belt, the population estimate of 218,000 is used. It is estimated that the value of wellbeing for the population living in its perimeter is between £8 million and £10 million per year. When combining both the Green Belt and the periphery, the estimated value of wellbeing is between £14 million and £17 million per year.
- The potential costs of building across the proposed South Hampshire Green Belt may cost the NHS between £431,000 and £691,000 in increased GP visits per year.
- The proposed Green Belt is estimated to generate £545,000 per year in wellbeing associated with recreation. This value assumes that there would be approximately 189,000 visits per year, of which 75,000 visits would be by foot and 114,000 would be by vehicle.

- The total potential economic benefit related to tourism and recreation associated with the proposed Green Belt is estimated as much as £1.3 million per year.
- The ecosystem services value currently provided by the proposed Green Belt for food, air pollution removal, carbon sequestration, flood mitigation, and biodiversity (non-use value) is estimated as £7.6 million per year with the most value deriving from its regulating services (carbon sequestration, air pollution removal, and flood mitigation).
- If Net Present Value (NPV) is applied using a discount rate and time period based on HM Treasury's *The Green Book: Central Government Guidance on Appraisal and Evaluation*,[2] the NPV over the next 60 years is estimated as ranging between £367 million and £452 million for wellbeing benefits, £35 million for economic benefits associated with tourism and recreation activity and £192 million for ecosystem services [food, air pollution removal, carbon sequestration, flood mitigation and biodiversity (non-use value)]. Note, when projecting future benefits, a degree of caution should be exercised given the assumptions involved.
- The findings show how strong arguments can be made for the value of health and wellbeing, recreation, and tourism-related economic activity and ecosystem services associated with the proposed Green Belt. It is important that this value is considered by planning authorities when addressing challenges such as growing housing demand and that by considering development on other land, particularly on previously developed land, it can potentially conserve this value.

Several limitations exist with this study including the availability of contextually specific data; acknowledged challenges of valuing social outcomes, such as wellbeing, and environmental impact, such as ecosystem services; the availability of only an approximation of the proposed Green Belt area; and a lack of alternative scenario comparisons for some estimations (ie the net benefit/loss). As such, the valuations used here are considered indicative and exploratory.

To further the case for a South Hampshire Green Belt, we recommend additional research, in particular more comparative work, comparing specific parts of the Green Belt with specific proposed developments. Furthermore, depth could be added to the valuation assessments by contextualising them, ensuring the local area and socioeconomic status of the population in South Hampshire are considered.

INTRODUCTION

South Hampshire has experienced considerable urban development over the last 60 years, with local planning authorities in Hampshire considering the expansion of the urban footprint into undeveloped green field land. CPRE Hampshire, the countryside charity, has set out a planning case for a new Green Belt for South Hampshire as part of a wider strategic vision for Hampshire. As part of this strategic vision, CPRE Hampshire wanted to explore how to value benefits associated with a Green Belt, particularly aspects that are traditionally difficult to value and therefore at risk of not being properly considered in policy and planning processes, such as wellbeing and the environment. They were also interested in exploring how a model that valued aspects of a Green Belt might have potential for general applicability for other Green Belts and countryside across England. They commissioned NEF Consulting to undertake this research, with the idea that insights from this work could strengthen their understanding of the value of the Green Belt as well as help them articulate their arguments for the introduction of a South Hampshire Green Belt to both decision-makers and the public. This research fits within a context of previous UK studies that focus on wellbeing benefits to individuals,[3] or the environmental benefits of ecosystems services.[4] It estimates the potential economic, social, and environmental benefits of having a South Hampshire Green Belt using existing academic literature, modelling, and financial proxies. We consider three different aspects of value associated with the proposed Green Belt:

1. Health and wellbeing benefits.
2. Economic activity associated with recreation and tourism.
3. The value of the ecosystem services.

For each aspect, we seek to value what is 'there' and at risk of being lost if this countryside is developed. All models, assumptions, and proxies used in estimations are taken from either academic literature or other credible sources. Nevertheless, given the challenges of having specific data for the proposed Green Belt as well as the challenges of estimating the value for benefits such as wellbeing and ecosystem services, the valuations used here are considered indicative and exploratory. For health and wellbeing, we explore the net decrease in value if green space is urbanised by developing a simple model based on the differences in physical activity and wellbeing levels for the greenest areas and the most built-up areas. The Outdoor Recreation Valuation (ORVal) tool developed by the University of Exeter was also used to estimate the wellbeing value of the proposed Green Belt. For tourism and recreation, economic activity, and ecosystem services, we focus only on the value of what is currently there, and as such these values are not considered net benefits. Net benefits were not considered in these cases in light of not having adequate data to input into a generalised model (as was the case for health and wellbeing) or specific information on proposed developments in the Green Belt (eg size and type). Nevertheless, these values present what is at risk of being lost if the proposed area is developed. For tourism and recreational activity, we used estimates on leisure activity expenditure as well as visitor frequency as the basis for exploring the economic benefits of the Green Belt. For ecosystem services, using references taken from the UK Government's *Ecosystem Service Databook*

(ESD), [5] combined with land use data taken from the CLC 2018 database,[1] we developed a simple model to estimate annual ecosystem service value of the proposed Green Belt.

The report takes the following structure. First, it outlines Green Belts and the arguments for their importance before looking specifically at the case of South Hampshire. Second, it describes the overall methodological approach used in this study. Each aspect is then covered in depth: health and wellbeing, recreation and tourism-related economic activity, and ecosystem services. Finally, there is a conclusion summarising the insights of this work and offering recommendations for further research.

What is a Green Belt and why is it important?

The aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open. The Government's National Planning Policy Framework (NPPF) outlines the purposes of Green Belt policy as follows[6]:

- Check the unrestricted sprawl of large built up areas.
- Prevent neighbouring towns from merging with one another (there is a strong view that settlements should be maintained as distinct and separate places).
- Assist in safeguarding the countryside from encroachment.
- Preserve the setting and special character of historic towns.
- Assist with urban regeneration, by encouraging the recycling of derelict and other urban land (it is important that local authorities identify the most sustainable locations for development and not impact the integrity of the Green Belt).

It is for local authorities to define and maintain Green Belt land in their local areas. Housing targets put pressure on local authorities to approve development on greenfield sites. The NPPF encourages the use of brownfield land before considering changes to Green Belt boundaries and sets out the conditions that must be fulfilled for 'exceptional circumstances' to exist, to justify such changes. Research has found that the number of residential units built on Green Belt land has increased over the past 10 years and the size of Green Belts is decreasing.[7] The Ministry for Housing, Communities and Local Government (MHCLG) reported that the Green Belt was 1,629,510 ha (16,295 km^2) at the end of March 2018, reduced in size by around 10,020 ha (100 km^2) since 2010/2011, due to local authorities adopting new plans. For example, ten local authorities adopted new plans in 2017/2018 resulting in a decrease of 5,070 ha (51 km^2) – the largest decrease in recent years.[8]

However, CPRE Hampshire has argued that building on Green Belt land would not solve the crisis in affordable housing and there should be a genuine 'brownfield first' approach.[8] Urban sprawl can cause a loss of agricultural capacity and consume large amounts of previously

[1]See https://www.eea.europa.eu/publications/COR0-landcover for information on CORINE Land Cover (CLC) and here for 2018 data https://land.copernicus.eu/pan-european/corine-land-cover/clc2018

productive land[9] or create larger commuting/travelling distances which would consequently increase air pollution and traffic congestion. Green belts can help to mitigate climate change by providing space for water to prevent flooding and/or reducing carbon dioxide levels through woodlands and vegetation. While Green Belts are under pressure to be developed, they are an effective tool for achieving the purposes set out in the NPPF under current planning legislation.

The Hampshire context

South Hampshire has experienced significant expansion of urban development over the last 60 years. It has a growing population and completely new communities have been established. Southampton, Eastleigh, Test Valley, and Fareham in particular have experienced significant expansion between 1950 and 2011.[10] Figure 1.1 shows the scale of development that has taken place between 1950 and 2011. The yellow areas show the settlements in 1950 and the pink and grey areas show how the settlements in South Hampshire have developed in 2001 to 2011, respectively. Figure 1.2 shows the Local Authority boundaries.

Figure 1.1: South Hampshire expansion 1950–2011[11]

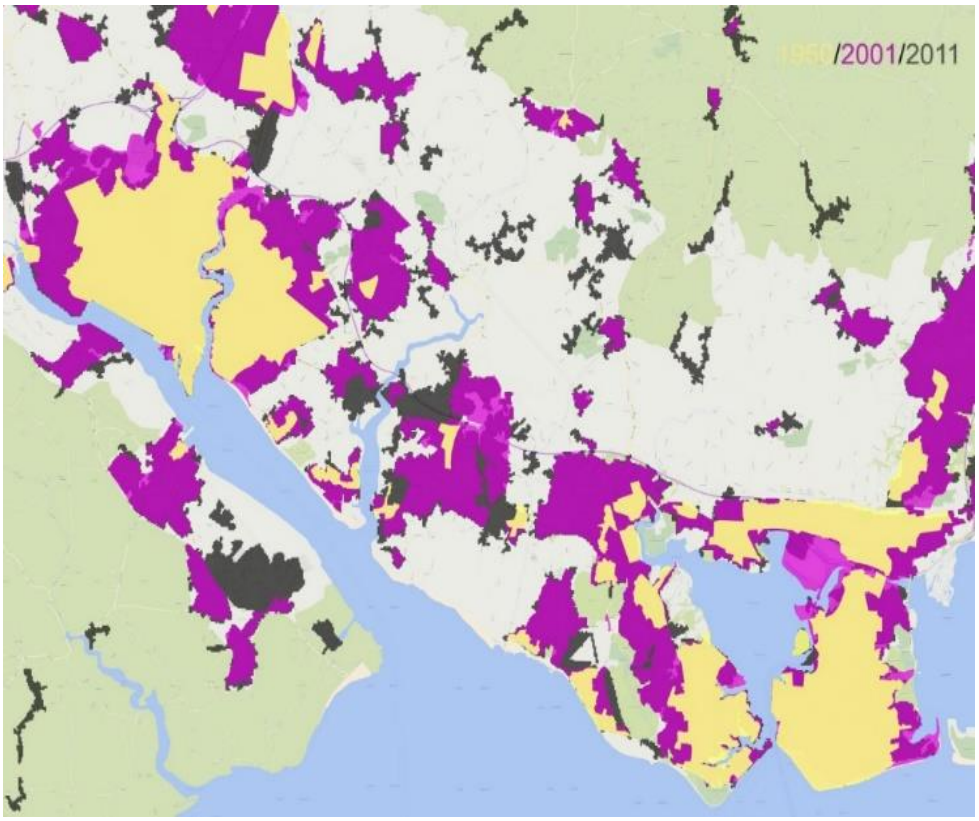
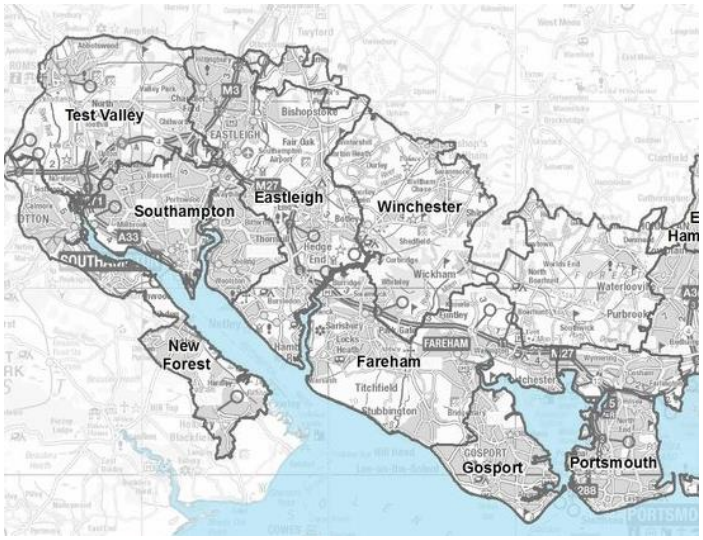


Figure 1.2: South Hampshire Local Authority Areas[12]



While meeting housing need is important, greenfield sites play an important part in protecting different settlements from merging and losing their identity. The introduction of a South Hampshire Green Belt is intended to protect the remaining countryside gaps and restrict further sprawl and coalescence between the urban areas of Eastleigh, Fareham, Test Valley, and Winchester Boroughs and Districts, and the Cities of Portsmouth and Southampton.

METHODOLOGY

Outcome identification

To evaluate the potential impact of the proposed Green Belt, it is important to understand what type of benefits Green Belts can contribute. The following potential benefits from Green Belts were identified:

- Provide access to open countryside for urban populations.
- Provide outdoor sport and recreation opportunities.
- Retain attractive landscapes and/or enhance landscapes near to where people live.
- Improve damaged and derelict land.
- Secure nature conservation interests.
- Retain land in agriculture, forestry, and related uses.
- Provide learn opportunities.
- Provide ecosystem services.[13]

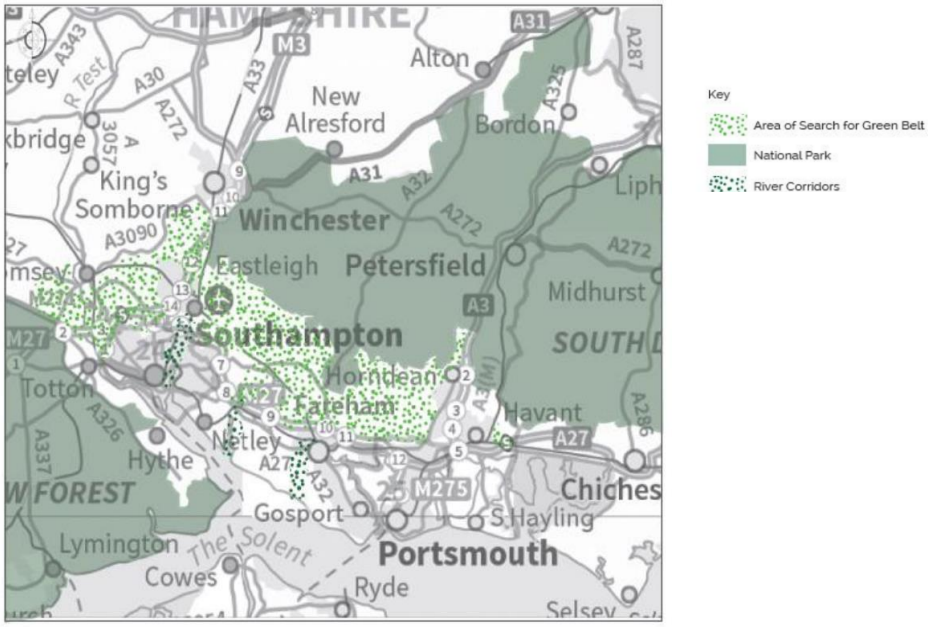
The scope of this research could not cover all outcomes. Following a review of potential outcomes and in discussion with CPRE Hampshire on data availability and their particular interests, it was decided to focus on the following three outcome areas: (a) health and wellbeing; (b) economic (recreation and tourism); and (c) environmental.

Population

The analysis uses the population corresponding to the immediate area of the Green Belt, the populated areas adjoining it, and a more general population for certain benefits (eg recreational benefits). The proposed South Hampshire Green Belt area has not been fully defined, therefore the figures in this study are based on the approximate area (Figure 2.1) and the surrounding population based on local level data.[2] Depending on the datasets used in each section, the size of the Green Belt under discussion varies. As such, figures should be treated as estimates.

[2] Using Middle Layer Super Output Areas (MSOA) – a defined geographic area designed to improve the reporting of small area statistics in England and Wales. The minimum population is 5000.

Figure 2.1: Green belt area of search proposed by CPRE Hampshire[14]



Valuation approaches

A variety of valuation techniques were used in this analysis:

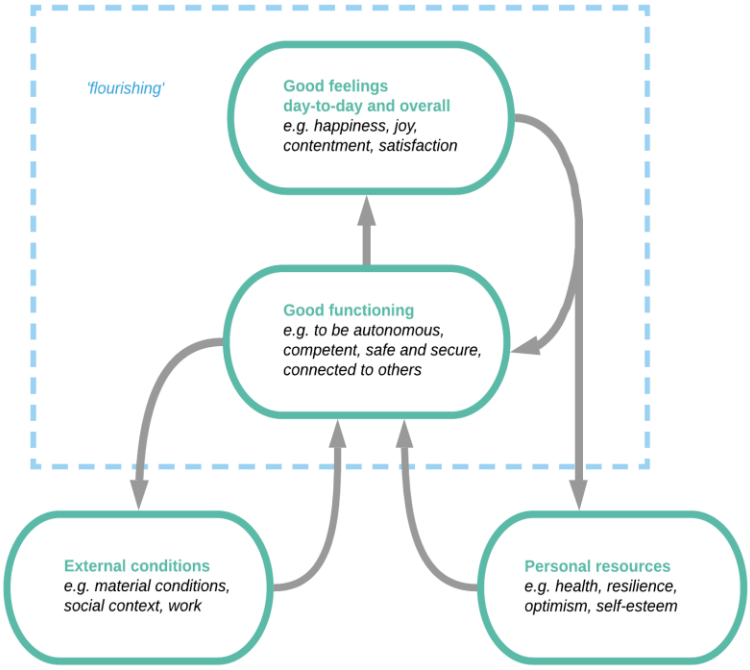
- Equivalent market value approach: using the cost of a good or service to value an outcome.
- Wellbeing valuation approach: Housing Associations Charitable Trust (HACT) together with Simetrica made the link between wellbeing and social value. Using government survey data on income and self-reported wellbeing, HACT calculates the monetary amount that would produce the equivalent impact on subjective wellbeing.
- University of Exeter's ORVal tool: using the time and travel costs incurred to take recreational trips from the Monitor of Engagement with the Natural Environment (MENE) survey data and presuming the value derived from that experience is worth at least the costs incurred in travelling to the site.

HEALTH AND WELLBEING IMPACTS

Defining wellbeing

Wellbeing describes how people experience their lives. It is best thought of as a dynamic process, emerging from the way in which people interact with the world around them. NEF's dynamic model of wellbeing conceptualises wellbeing into two aspects: (i) Personal wellbeing comprising emotional wellbeing (positive feelings and absence of negative feelings); satisfying life; vitality; resilience and self-esteem (self-esteem, optimism and resilience); and positive functioning (autonomy, competence, engagement, and meaning and purpose); and (ii) Social wellbeing comprising supportive relationships, and trust and belonging.[15] The model shows that factors affecting our wellbeing are mutually reinforcing Figure 3.1). For example, if the external conditions are enabling (eg your job or where you live), it is easier to function and therefore you gain greater life satisfaction.

Figure 3.1: Dynamic model of wellbeing



Relationship between health and wellbeing, and green space

While there is limited evidence of the physical and mental health benefits specifically associated with a Green Belt, there is a large body of evidence of the physical and mental health benefits of green and open spaces. The literature referenced in this section refers to benefits from green spaces and woodlands in both rural and urban environments.

Improved emotional wellbeing

Green spaces are associated with higher levels of mental wellbeing. Several studies use the self-reported health and wellbeing of individuals to explore links between green spaces and mental wellbeing. Often the terminology differs across studies and indicators used for

measurement vary. For example, some studies have established differences in more specific measures, such as life satisfaction, quality of life, happiness, and vitality.[16]

Research suggests that there is a strong association between the availability of green space in a local area and mental wellbeing. For example, the greater the amount of green space available, the higher wellbeing for individuals.[17] More specifically, research has indicated that land cover in rural areas is positively related with good mental health.[18] Other studies show how perceptions of having sufficient local green space and satisfaction with the quality of green space are statistically related to better mental wellbeing, specifically for those in disadvantaged urban communities.[19]

Not only is green space associated with higher levels of wellbeing but there is evidence to suggest that individuals who live *closer* to green space have even higher levels of wellbeing in comparison to those who do not.[20] Studies have also explored types of green space and found that certain land types are differentially associated with positive mental health within individuals (although research in this area is limited). One study found that all green outdoor land cover types result in greater mental health for individuals,[21] while another found that there were positive associations with an increase in access to natural grassland and heath and bog.[22]

Some studies have found that green spaces are associated with greater life satisfaction. One study found that an area with greater green space is positively connected to higher life satisfaction.[23] Although research in the UK is limited, there is a range of international evidence to suggest a link to life satisfaction, particularly in relation to a subjective connection with nature.[24]

Improved social wellbeing and community cohesion

Many studies find that both activities and leisure time are strongly associated with combatting loneliness. While there is limited evidence suggesting a direct link between green space and reduced loneliness specifically, there is evidence of the role green spaces can play in activities and leisure time. Many evaluations show leisure activities and hobbies in green spaces as having a positive impact on an individual's feelings of loneliness and isolation. For example, the evaluation for the South Downs National Park Authority provides qualitative evidence from residents who participate in activities in green open spaces and helps them address feelings of loneliness and isolation.[25] Similarly, a review of Greenspace Scotland's programmes found that there was increased social cohesion as a result of walking groups and greater involvement from the community in the local park.[26]

Greenspaces can bring people together and create community cohesion as people engage with one another. Some studies show that community woodlands often help to bring the community together.[27,]

Improved physical health

Studies identify that the link between physical health outcomes and green space is due to increased levels of physical activity. Some but not all studies support the argument that people who use green spaces are more likely to live nearby. One study found that there is a positive association between green space and activity levels – those living in the greenest areas of England are more likely to achieve the recommended amount of physical activity in comparison to those living in the least green areas.[28] Other health benefits linked to green space include a decreased risk of type 2 diabetes, cardiovascular morbidity, stroke,

hypertension, and heart disease and an increased incidence of self-reported health.[29] The frequency of physical activity reduces the farther somebody is from a green space. Provision of good access to green spaces may promote physical activity and therefore physical health. Those living closer to green space are less likely to be obese.[30]

Similarly, research has found that green space is generally associated with better population health.[31] More specifically, the physical and mental health benefits of green spaces show that income-related inequality in health is less pronounced where people have access to green space.[32] Some studies explore links between deprivation and green space, with this research finding populations living in areas of higher deprivation having less favourable environmental conditions (such as air quality, green space, housing conditions, habitats favourable to biodiversity, and more) in comparison to those living in the least deprived areas.[33]

Valuing the benefits

Several papers place a monetary value on emotional wellbeing and the additional value of wellbeing in relation to green spaces. The approaches considered for valuing health and wellbeing benefits associated with the South Hampshire Green Belt are as follows:

- Many academic papers use the Short Warwick-Edinburgh Mental Well Being Scale (SWEMWBS) to measure levels of wellbeing. Using the HACT mental health social value calculator, we are able to place a monetary value on the SWEMWBS score.
- Fields in Trust used a Willingness-To-Pay approach to value green space (including parks). It found that, on average, the annual wellbeing value of a park and green space user is £1,814 with a lower bound of £974 and upper bound of £2625.
- The ORVal tool created by the University of Exeter values the welfare benefit (wellbeing benefit) from recreational sites and is recognised by HM Treasury's *The Green Book: Central Government Guidance on Appraisal and Evaluation*.
- A study converted the number of visits to a forest and estimated the number of visits to nature using MENE data on physical activity undertaken during recreational visits. The Quality-Adjusted Life Year (QALY[3]) approach was used to establish the link between physical activity and health. Intense physical activity, if taken once a week for a year, is equivalent to 0.0107 QALYs.[34]

Assumptions

The key assumptions underpinning the valuation approach of health and wellbeing benefits from the proposed Green Belt are as follows:

[3] A QALY is a measure of the state of health of a person in which the benefit, in terms of length of life, are adjusted to reflect quality of life. One QALY is equal to 1 year of life in perfect health.

- The population living in the Green Belt is estimated to be 35,700,4 and the population in the populated area adjoining the Green Belt, the periphery, is estimated to be 182,300. This figure is based on the surrounding MSOA data for areas in Portsmouth, Fareham, Eastleigh, and Southampton. These population estimates are applied to most of the valuation methods; others are based on visit estimates that have been produced by the ORVal tool. To be conservative, it is assumed that 30% of the population living on the periphery receives the health and wellbeing benefits from the Green Belt.
- It is assumed that the proposed Green Belt is accessible to the public. Using the ORVal tool, extensive public rights of way in the proposed Green Belt have been identified for people to use.
- The two neighbouring national parks (South Downs National Park and New Forest National Park) would not discourage the public from using the proposed Green Belt land, which would be closer to hand for many of the population of South Hampshire which continues to grow, causing greater demand for recreational activities.[35]

More details about assumptions specific to each methodology are explained in the following sub-sections.

Limitations

Although there is a vast amount of literature to suggest the positive relationship between green space and wellbeing, it is difficult to quantify. The research and understanding of what elements/factors of greenspace influence wellbeing are still developing. As such, the following valuations of wellbeing serve as broad estimations of the potential value the Green Belt brings to individuals and the state. Some limitations to consider include:

- Limited ability to adjust the value of the health and wellbeing benefits to the local context and demographic of the local population.
- The Green Belt is not fully defined, therefore the values produced are based on less accurate estimates of the population and land within the area.
- There is a risk that physical health and mental wellbeing may be interrelated, therefore the value of improved physical health to individuals is not included in our assessment. This would be classed as double counting, ie when the benefits from outcomes overlap and are counted more than once.
- Engagement with stakeholders was outside the scope of the project and the valuation approach does not take into account the demographic and socioeconomic factors (eg age, gender, ethnicity, deprivation) associated with the population of South Hampshire.

[4] Based on Middle Layer Super Output Area (MSOA) data (Geographic data) that includes areas of Winchester, Test Valley and Eastleigh.

- We might be undervaluing the negative impacts in the reverse scenario (the loss of the green space may have a greater impact than keeping it). This is known in behavioural economic theory as loss aversion – a preference to avoid losing something compared to gaining the equivalent amount. For example, some might argue that people value going outdoors into the countryside a lot higher when the ability to do so has been taken away or limited.
- The potential benefits associated with urban development have been excluded from the scope of this analysis.

Improved physical health – savings to the state

As mentioned earlier, there is always a difficulty in estimating the value of improved physical health alongside mental wellbeing as there is a risk of double counting. For the purposes of this report we have estimated the savings to the NHS because of improved physical health for people who live in the Green Belt.

There are several assumptions underpinning this approach:

- Those who live in the greenest quintile are 24% more physically active and those who live in the median green quintile are 8% more physically active than those who live in the least green quintile.[36] By 'greenest quintile' we mean geographic areas with the most green space and by 'least green quintile' we mean areas with the least green space.[5]
- The population within the Green Belt is healthier in comparison to those who are living in areas with less exposure to green space. This assumption comes from a study suggesting that higher exposure to green space is beneficial for several health conditions (e.g. type II diabetes and cardiovascular mortality).[37]
- The average member of the public visits their GP six times or fewer a year, based on NHS statistical trends in consultation rates.[38]
- Based on a paper by Daniel Fujiwara, we assume that people who report good health are 25.4% less likely to visit the GP six or more times per year.[39]
- The potential cost to the NHS from urban development within the Green Belt comes from an increased number of GP visits associated with less access to green space.
- The cost of a GP appointment is taken from PSSRU6 database (based on actual NHS costs and updated annually) and shows two values based on an upper bound (£39) for

[5] In the paper written by Mytton et al. (2012), the least green quintile has between 1.27% and 23.37% of green space, the median quintile has between 37.66% and 57.18% of green space, and the greenest quintile has 83.81% and 98.58% of green space. This excludes private gardens.
[6] Personal Social Services Research Unit

the cost of a GP appointment and lower bound (£33).[40] The financial proxy was then applied to each GP visit estimated.

The calculation used to estimate the costs to the state is shown in Figure 3.2. The number derived from this calculation is the cost to the NHS if the population were living in the least green quintile.

Figure 3.2: Calculation used to estimate average GP visits if the population was in the least green quintile

We know that those living in the greenest quintile are 24% more physically active and therefore assumed to report good health. Furthermore, we have assumed that those who report good health are 25.4% less likely to visit the GP. Figure 3.3 displays the calculation if the population lives in the greenest quintile.

Figure 3.3: Calculation used to estimate average GP visits assuming the population is in the greenest quintile

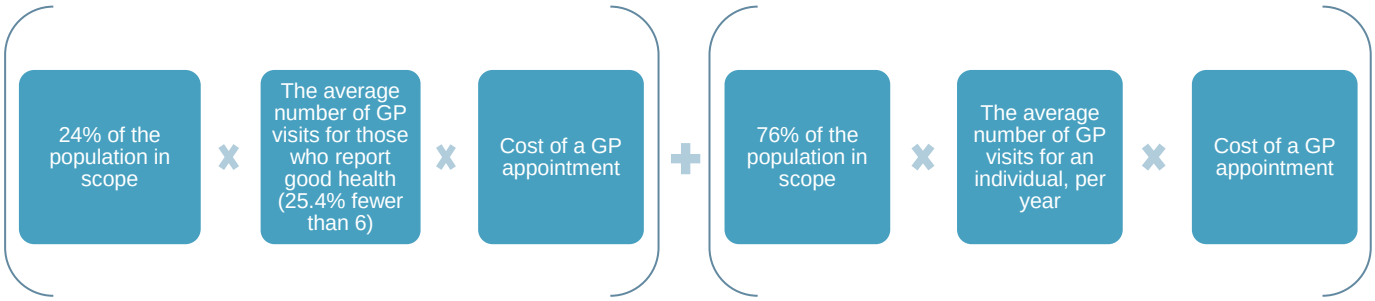


Table 3.1 shows the potential costs to the NHS for those who live within the Green Belt. Column 1 shows the estimated cost of a GP appointment if the area in scope is in the 'least green' quintile. Column 2 is calculated on the assumption that because of those living in the greenest area being more physically active, they are now 25.4% less likely to visit the GP six times per year. It presents the difference between changes in the Green Belt going from the greenest quintile to the least green.

Table 3.1: Difference between least green quintile and greenest quintile

	Estimated cost to the NHS (least green quintile)	Estimated cost to the NHS (greenest quintile)	Extra cost to NHS per year
Estimated cost to NHS (upper)	£8,354,034	£7,844,772	£509,262
Estimated cost to NHS (lower)	£7,068,798	£6,637,884	£430,914

Values in Table 3.2 are based on 30% of the estimated population on the periphery of the proposed Green Belt. Building on these assumptions, we assume that those households on the periphery of the Green Belt are in the median quintile. It presents the potential costs to the NHS if households in this area were to move from a median quintile to the least green quintile as a result of building on the Green Belt.

Table 3.2: Difference between least green quintile and median green quintile

	Estimated cost to the NHS (least green quintile)	Estimated cost to the NHS (median quintile)	Extra cost to NHS per year
Estimated cost to NHS (upper)	£12,797,460	£12,537,416	£260,044
Estimated cost to NHS (lower)	£10,828,620	£10,608,582	£220,038

When combining the figures from Tables 3.1 and 3.2, we can estimate the total costs to the NHS for those living both inside the Green Belt and on the periphery. Using these numbers, we can estimate that building on the Green Belt could cost the NHS between £770,000 and £691,000 per year, as shown in Table 3.3.

Table 3.3: Estimated cost to NHS for the population in and on the periphery of the Green Belt

	Estimated cost to the NHS (least/middle quintile)	Estimated cost to the NHS (greenest quintile)	Extra cost to NHS per year
Estimated cost to NHS (upper)	£21,151,494	£20,382,188	£769,306
Estimated cost to NHS (lower)	£17,897,418	£17,246,467	£690,958

Using the more conservative estimates, the potential costs of building across the proposed South Hampshire Green Belt may cost the NHS between **£431,000 (if considering the population within the Green Belt only)** and **£691,000 (when combining the Green Belt population with those on the periphery) in increased GP visits per year**. We can consider this to be a conservative estimate of NHS savings as a result of health benefits, as these estimations do not account for the NHS costs associated with low physical activity such as an increase in type-2 diabetes, cardiovascular disease, and cancer, which are out of the scope of this study. More research should be done to explore other possible benefits that may impact use of the NHS and attending GP appointment.

Wellbeing from recreational activities

The ORVal tool uses spatial data to model the welfare (or wellbeing) benefits that are provided by accessible green space. The tool developed by the Land, Environment, Economics, and Policy (LEEP) Institute at the University of Exeter is based on a model of

recreational demand for outdoor green space in England (ie what the value could be if people used this space as an recreation area). ORVal's functions allow users to:

- Explore the visitation and welfare values that are generated by current accessible greenspaces across the UK.
- Estimate the visitation and welfare values that might be generated by new green spaces across the UK.

The green spaces identified on the ORVal map take three different forms: areas, paths, and beaches. The tool uses the travel cost method[7] to place a value on the green space. The average value per visit to green spaces is between £3.06 and £4.62.[8] Using recreational trip data collected in the annual MENE survey, it creates a demand model to predict the number of visits to green spaces and predicts how likely it is that an individual will take a trip on a particular day. The likelihood differs according to the attributes and proximity of the green space and the attributes and proximity of alternative green spaces (eg it could consider South Downs National Park – a green space that is on the edge of the proposed Green Belt).

In addition, the tool takes into consideration the type of land in an area and uses MENE data to determine whether particular characteristics could make a difference in choosing to visit a green space. At present, the tool identifies four land cover types (managed land, natural land, water margin, and 'other'). These are broken down into sub-categories as shown in Table 3.4. The land-cover percentages within the Green Belt have been lifted from CLC data. Those land types that cover less than 1% of the proposed Green Belt were not included in the ORVal estimation as the tool requires whole numbers only.

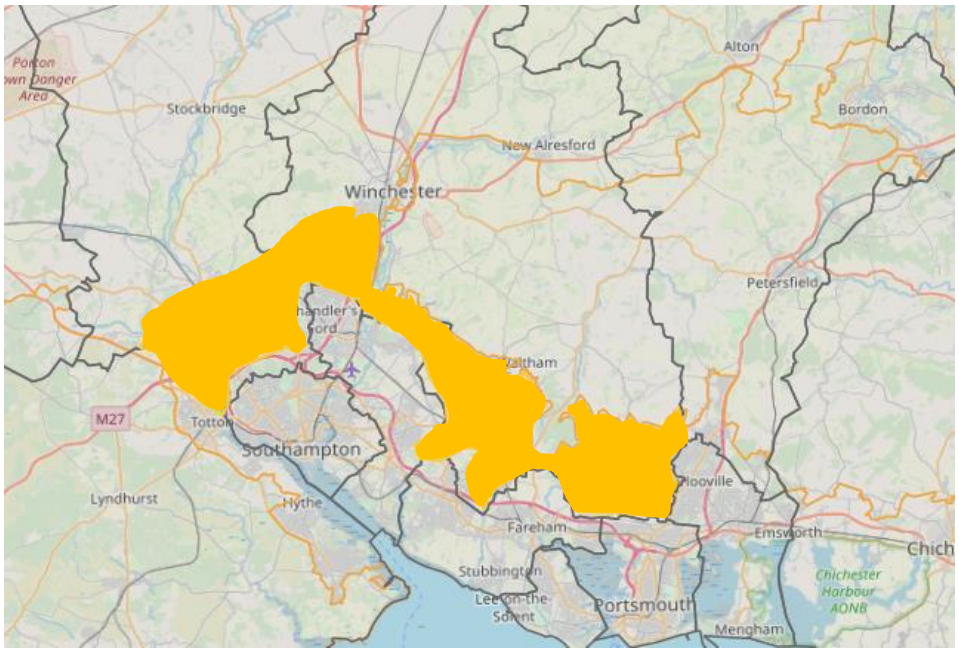
Table 3.4: Land cover percentages for proposed Green Belt

Land type	Land cover (proportion of Green Belt)
Pastures	67%
Arable land	14%
Permanent crops	<1%
Mixed forest	8%
Broad-leaved forest	6%
Coniferous forest	2%
Moors and heathland	2%
Inland waters	<1%
Wetlands	<1%

[7] Using the time and travel costs incurred to take recreational trips and presuming the value derived from that experience is worth at least the costs incurred in travelling to the site.
[8] This is based on 2016 prices from the Department for Environment, Food and Rural Affair (Defra) Services Databook, 2020.

The tool requires the user to outline the area of the recreation site. In this case, the recreation site is the proposed Green Belt. As such, the area defined is an approximation. Figure 3.4 presents the rough outline of the proposed Green Belt and its interaction with different local authorities. The defined area covers land in Winchester, East Hampshire, Fareham, Eastleigh, Test Valley, and New Forest, and is approximately 20,000 ha in size. Please note that this valuation method is based on a rough estimation of the Green Belt perimeters and the wellbeing values generated present benefits to society assuming that the area is accessible.

Figure 3.4: Map of area used for ORVal estimations



The value the area is estimated to generate in **wellbeing associated with recreation is £544,500 per year,** assuming that the Green Belt is accessible via public rights of way**.** This value assumes that there would be approximately 189,000 visits per year, of which 75,000 visits would be by foot and 114,000 would be by vehicle.

Wellbeing from living in a green space

As mentioned earlier, there is a positive relationship between living in an area of high quality/quantity of greenspace and increased wellbeing. A study found people living in the greenest areas were 7.4% more likely to report high levels of wellbeing than those who lived in the least green area using data collected from the General Health Questionnaire (GHQ) as an indicator for mental wellbeing.[41]

Our valuation approach here takes monetary valuations used to measure changes in the SWEMWBS scale to estimate the value of wellbeing at risk if the Green Belt is used for development. There is no established method to convert the GHQ score to an SWEMWBS score; however, the paper we have based our assumptions on distinguishes between ‘high’ and ‘low’ wellbeing using the GHQ. Using this split between high and low, we split the SWEMWBS scores into high to low categories.

We calculated the value using several assumptions:

- The estimated population living in the proposed Green Belt is 35,700.

- The estimated population living on the periphery of the proposed Green Belt is 182,300, of which 30% is assumed to experience wellbeing benefit.
- We assume that those living in the proposed Green Belt live in the greenest quintile and those living on the periphery live in the median quintile.
- Using a recent study that provided us with figures to calculate a difference in wellbeing levels and living in a green space,[42] we estimate that people living in the greenest areas are 7.4% more likely to report high levels of wellbeing than those who live in the least green quintile. People living in the median quintile for green areas are estimated to be 6% more likely to report high levels of wellbeing that those who live in the least green quintile.
- The categorisation for SWEMWBS scores is as follows: scores lower than 20 are low; scores between 20 and 28 are medium; and scores between 28 and 35 are classified as high.[43]

Limitations

- It is difficult to translate or make a distinct comparison between a 35-point scale (SWEMWBS) and a 10-point scale (GHQ). The paper written by White et al. categorises the GHQ into high (8–10) and 'low' (1–7). This is a fundamental limitation for this valuation approach and therefore we have chosen to use the difference between financial values for high and medium SWEMWBS scores in our estimate as opposed to low and high in order to be conservative. That is, the 6.0 or 7.4% of people in the area who have high wellbeing in a Green Belt, would have had medium wellbeing in an urban area.
- The study we reference in our assumptions that provides insight into the relationship between the level of green space and wellbeing[44] does not show a statistically significant relationship when controlling for other socioeconomic variables. While this is a fundamental flaw in our method, nonetheless it is the only paper accessible at this time (relevant to the UK context) that enables us to estimate differences in wellbeing levels based on the quantity of green space. The paper uses cross-sectional data as opposed to longitudinal data, which may provide insight into why there was no statistical significance. Other papers in this context have shown a statistically significant relationship between green space and wellbeing,[45] but do not provide enough detail for inclusion in the model.

We took the following steps to estimate the wellbeing benefits for those living in the greenest quintile in comparison to those living in the least green quintile:

1. We estimated the difference between the greenest areas and least green areas. Using the academic study cited in the assumptions, we estimated the difference in the proportion of population scoring high in the GHQ for those who live in the greenest areas and those who live in the least green areas. We combined the indicators for life satisfaction, eudaimonic wellbeing, and experimental wellbeing in the GHQ to provide an estimate of overall wellbeing. The estimated difference in wellbeing between the greenest and least green quintiles was 7.4%.

2. After assigning high, medium, and low categories, we estimated the value for each SWEMWBS category by calculating the average for each score in the assigned range using the HACT mental health calculator. For example, medium has an average value of £23,274 based on the values provided by the HACT mental health calculator (defined as those who score between 20 and 28 on the SWEMWBS scale). Table 3.5 shows the values by score categorisation.

3. The next step involved multiplying the **population in the Green Belt** by **7.4%,** which provided an estimate of the proportion of the population in the Green Belt with high wellbeing. We then multiplied this figure by **£25,836** (the value for a high score) to estimate the total wellbeing benefit gained in comparison to living in the least green quintile.

Table 3.5: Value of SWEMWBS category

SWEMWBS score category	Estimated value
Low	£9,864
Medium	£23,274
High	£25,836

Table 3.6 presents the range of values representing the wellbeing benefits of the proposed Green Belt. Two values are presented for both the population living in and on the periphery of the Green Belt are displayed to establish an upper and a lower bound.

Table 3.6: Value of wellbeing benefits

Population	Assumed quintile	Wellbeing gained in comparison to living in the least green quintile	Estimated wellbeing benefits per year
Living in the Green Belt	Greenest	7.4%	£6,769,480
	Median	6.0%	£5,488,767
Living on the periphery	Greenest	7.4%	£10,370,388
	Median	6.0%	£8,408,423

Using these values, we estimate that the wellbeing for the population living in the Green Belt is between £5,489,000 and £6,769,000 greater per year than in an alternative scenario where the proposed Green Belt is replaced by urban development. This value relates to the potential wellbeing loss if the whole Green Belt was urbanised and should be proportionately adjusted to the scale of proposed urban developments in the area. When including the people who are on the periphery of the proposed Green Belt, we used a population estimate of 92,190. Therefore, we estimate that the wellbeing for the population living in the perimeter is between £8,408,423 and £10,370,388 per year.

Using this analysis, the wellbeing benefit of the Green Belt could be between **£13,897,000 and £17,140,000 of wellbeing benefit per year.** Looking at benefits beyond annual value, it is possible to discount future value by using the NPV technique. HM Treasury's *The Green Book: Central Government Guidance on Appraisal and Evaluation*[46] provides guidance on

discount rates to use. There are limitations associated with using this valuation technique given the assumptions required in assigning a discount rate. However, if one uses the Standard Social Time Preference Rate (STPR) outlined in this guidance, the NPV estimates **wellbeing benefit ranging between £366,536,981 and £452,071,948 over the next 60 years**.[9]

[9] The discount value is 3.5% for the first 30 years and 3% for the remaining 30 years.

ECONOMIC ACTIVITY- RECREATION AND TOURISM

In addition to health and wellbeing benefits, there are economic benefits linked to recreational and cultural activities in the Green Belt.

Activities in the Green Belt

Many tourist attractions and recreational activities are heavily driven by the natural environment. There are several recreational and leisure attractions in the proposed Green Belt including historic towns. From golf courses to woodlands to fisheries, the area within the proposed Green Belt has the potential to provide great economic benefit to the adjoining urban areas as a result of outdoor or countryside recreation. Additionally, there are recreational and leisure attractions in the outlined area including several historic towns and villages, such as Bishop's Waltham, Romsey and Wickham. Heritage attractions include Bishop's Waltham Palace and Portsdown Hill Forts. The Green Belt has the potential to play a role in protecting the historic setting of Winchester and maintain its separation from Southampton and Eastleigh. The heritage tourism sector plays a large part of the UK's broader tourism economy;[47] however, this element is excluded from the scope of this report.

Effects on local businesses

The potential positive impacts of tourism resulting from people visiting natural spaces, particularly on the local economy, landscapes, and local communities are illustrated in Table 4.1. There are also potential negative impacts of tourism, such as damage to landscapes and traffic and pollution.

Table 4.1: Impacts of recreation and tourism[48]

Potential positive impacts
Jobs for local people
Preservation of rural services (eg buses and post offices)
Conservation of habitats and wildlife
Increased demand for local goods
Increase income for local businesses

The National Natural Capital Accounts estimated the total expenditure that nature provides through recreational activities at £8 billion in England in 2017.[49] The economic impact is said to be significant to a lesser extent as many outdoor activities require minimal expenditure.[50]

Valuing benefits

In this section of the report, we value the potential that would be lost if the proposed Green Belt became an urban development.

We used two valuation approaches to demonstrate the potential expenditure on recreational and tourist activities in the Green Belt. First, we estimated the expenditure by recreational activity. This approach provided an indication of what type of spend may be taking place in

the Green Belt and should not be treated as a 'total spend' figure. The second approach used an analysis of MENE survey data combined with visit estimates from ORVal to estimate the total expenditure from recreational activities per year.

Assumptions

The following points highlight the key assumptions underpinning the valuation of economic benefits from the proposed Green Belt:

- The number of visits per year are those derived from ORVal tool (189,000).
- The proposed Green Belt is accessible to the public via public rights of way and open access land. Using the ORVal tool, we know that there are extensive public rights of way in the proposed Green Belt for people to use, including four long-distance walks (Itchen Way, Test Way, King's Way, and Wayfarer's Walk).
- The existence of the two neighbouring national parks (South Downs National Park and New Forest National Park) would not discourage the public from using the proposed Green Belt as the population of South Hampshire continues to grow, causing greater demand for recreational activities.[51] Also the Green Belt is closer for many who live on its periphery and could relieve potential pressure on the more sensitive landscapes of the National Parks.

Limitations

The valuation approach has several limitations:

- The Green Belt is not fully defined, therefore the values produced are based on approximations of the area.
- Stakeholder engagement was outside the scope of the project and the valuation approach does not consider the demographic and socioeconomic factors (eg age, gender, ethnicity, deprivation) associated with the population in South Hampshire.
- We may be undervaluing the negative impacts in the reverse scenario (the loss of the green space may have greater impact than keeping it).
- The potential benefits associated with urban development have been excluded from the scope of this analysis.
- Here, the percentage of population taking part in each recreational activity is equivalent to the percentage of visits that involve a sport/recreational activity. While acknowledging that the proportion of visits involving recreational activities may be higher, the expenditure is not being overestimated.

Estimated spend per activity

Table 4.2 provides estimates of average participation and expenditure in sport and recreation based on data from Sport England's Active People Survey. A paper by Reconomics provided the expenditure per visit for a particular activity. This has been adjusted for inflation.

Table 4.2: Monthly participation in sport and recreation[52]

Activity	Percentage of adult population (14+) taking part in the activity[53]	Average spend per visit[10] (adjusting for inflation)	% of visits involving any spend[11]
Recreational walking	53.8%	£11.55	44%
Horse riding	0.7%	£19.63	18%
Fishing	1.8%	£29,00	58%
Running	6.3%	£4.62	15%
Cycling	8.1%	£8.08	54%

The figures provide an estimate of what the spend may be per recreational activity in the proposed Green Belt. This is **not** used to estimate the **total** spend across the proposed Green Belt but demonstrates what the loss may be per recreational activity. For the purposes of this report, we have estimated expenditure for the activities most likely to occur in the proposed green Belt (based on background research of the area). The 'percentage of adult population' and '% of visits involving spend' columns are applied to the total visits estimated by ORVal in the previous section (ie 189,000). Table 4.3 presents the total estimated expenditure per activity per year.

Table 4.3: Estimated expenditure for recreational activities likely to occur in the Green Belt

Activity	Estimated expenditure per year
Recreational walking	£305,889
Horse riding	£2,767
Fishing	£33,721
Running	£4,884
Cycling	£39,540
Total	***£386,801***

It is estimated that the total expenditure from the five recreational activities alone could be as much as **£386,000** per year**.** The money spent on recreation and leisure activities would be lost if it were to become an urban development.

[10] MENE survey data, March 2009 – February 2013

[11] MENE survey data, March 2009 – February 2013

Total estimated expenditure

The following valuation approach estimates total expenditure from recreational and leisure activities in the Green Belt. The estimate of the expenditure is based on several papers that use analysis and data from the annual MENE survey. Using average estimates of spending per visit to a green space, we can estimate the total loss in expenditure if it the area were to become an urban development. The valuation approach is based on the following assumptions:

- Analyses provided from Defra and Natural England tell us that approximately one-third (27%) of visitors to a green space involve some form of expenditure.[54]
- For 27% of visits that have some form of expenditure, the average spend is £27.[55] (When adjusted for inflation the value is £30.16.)
- The Annual MENE survey data collected spend data and found that when people take trips to green space, they are most likely to purchase food (22%), fuel (6%), and parking (5%).[56]
- The Green Belt would have approximately 189,000 visits per year, based on modelling from the ORVal tool. These visits are split into those who would visit by car (114,000) and those who would visit the green space by foot (75,000).
- For the visits to the Green Belt by foot, we have assumed the average expenditure to be one-third less. We therefore valued their spend at £20.20 (excluding fuel and parking costs and other expenditure that may be lower for local visitors, such as food and drink).

There are several limitations and elements of the valuation approach that could be improved on if we were to incorporate accessibility and population demographics and have a more defined area in scope. The current approach only values the benefit of the Green Belt to the economy if it were recognised as a recreation site as mapped out in the ORVal tool. One way to improve valuing the benefit of outdoor recreation and tourism would be to include surveying residents in Hampshire to ask what type of activities they would undertake in the green space (as shown in the previous sub-section). In addition, the negative impacts of recreation and leisure have not been considered, which may impact the wellbeing benefits of residents, as well as the negative impact on the physical environment.

Table 4.4: Benefits as a result of tourism

Visits	Number of visits that spend money	Estimated expenditure per year
Visits by vehicle	30,800	£928,000
Visits by foot	20,200	£407,600
Total	51,000	£1,335,600

It is estimated that 51,000 out of 189,000 visits will spend money in the Green Belt, of which the majority would travel there by vehicle. **The total potential economic benefit related to tourism and recreation associated with the proposed Green Belt is estimated as much as £1,335,600 per year,** as shown in Table 4.4**.**

Looking at benefits beyond annual value, it is possible to discount future value by using the NPV technique. HM Treasury's *The Green Book: Central Government Guidance on Appraisal and Evaluation*[57] provides guidance on discount rates to use. It should be noted there are limitations associated with using this valuation technique given the assumptions required in assigning a discount rate. However, if one uses the Standard STPR outlined in this guidance, the NPV for **the potential economic benefit related to tourism and recreation is estimated as much as £35,226,797 over the next 60 years**.[12]

[12] The discount value is 3.5% for the first 30 years and 3% for the remaining 30 years.

ECOSYSTEM SERVICES

Accounting for the costs and benefits to society of the creation or destruction of the natural world is a complex task. One approach increasingly used to capture and communicate the value of nature and ecosystems involves the concepts of natural capital and ecosystem services. This approach frames beneficial *flows* (ecosystem services) derived from natural capital *stocks* as supplying society with economic, social, environmental, and cultural benefits.[58] Ecosystem services are often categorised as follows:

- **Provisioning services:** products/goods people obtain, such as food and timber.
- **Regulating services:** benefits people obtain from the regulation of ecosystem processes, such as air pollution removal and flood damage mitigation.
- **Supporting services**: while not providing direct services themselves, supporting services are necessary to produce all other ecosystem services. An example is the cycling of nutrients.
- **Cultural services:** nonmaterial benefits people obtain from ecosystems, such as recreational use and wellbeing.

The value of ecosystem services can be described either qualitatively or quantitatively, sometimes in monetary form.[59] In doing so, it aims to ensure the environment is accounted for in economic decision-making. While there is utility in this approach, it possesses numerous limitations, namely the challenges of obtaining sufficient data and the reality that not all of nature's benefits can be quantified in monetary terms.[60,61]

In January 2020, the UK Government published new guidance on natural capital and its calculation. This guidance provides a wealth of resources on valuing natural capital and ecosystem services.[62] Using references taken from its ESD, combined with land use data taken from the CLC 2018 database,[13] we developed a simple model to estimate annual ecosystem service value of the proposed Green Belt. Figure 5.1 and Table 5.1 present the area for which we estimated ecosystem services and the breakdown of land type, respectively.[14]

[13]See https://www.eea.europa.eu/publications/COR0-landcover for information on CORINE Land Cover (CLC) and here for 2018 data https://land.copernicus.eu/pan-european/corine-land-cover/clc2018

[14] Note, the total area of the CLC 2018 map segments used for ecosystem services calculations does not align exactly with the proposed Green Belt and is considerably larger (approximately 43,000 ha. To account for this, we have estimated the land cover type that fits into the proposed Green Belt by reducing agricultural land area by 50% (arable land, pastures, and permanent crops) and forest land by 75%.

Figure 5.1. Area used for estimation of proposed Green Belt ecosystem services. Taken from CLC 2018. Urban areas (red) are for display only and were not used in calculations.

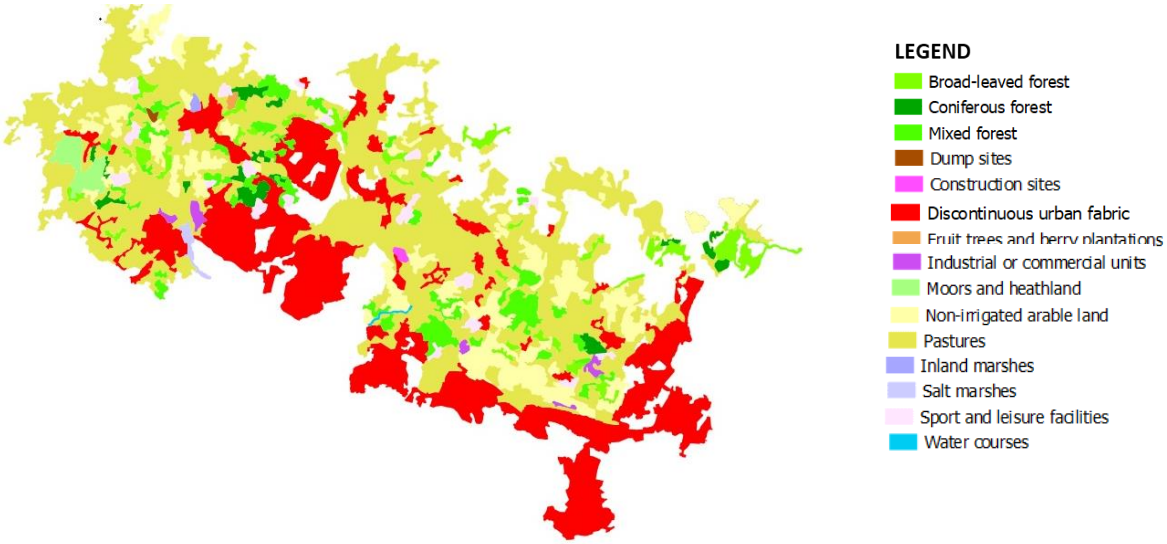


Table 5.1. Breakdown of land type in proposed Green Belt area

CLC 2018 type	Area (Ha)	% total area
Arable land	**3032.97**	**12.76%**
Non-irrigated arable land	3032.97	12.76%
Pastures	**14522.64**	**61.08%**
Pastures	14522.64	61.08%
Permanent crops	**33.76**	**0.14%**
Fruit trees and berry plantations	33.76	0.14%
Forests	**5178.06**	**21.78%**
Mixed forest	2498.60	10.51%
Broad-leaved forest	1878.26	7.90%
Coniferous forest	801.20	3.37%
Scrub and/or herbaceous vegetation associations	**712.57**	**3.00%**
Moors and heathland	712.57	3.00%
Inland waters	**59.03**	**0.25%**
Water courses	59.03	0.25%
Inland wetlands	**65.94**	**0.28%**
Inland marshes	65.94	0.28%
Maritime wetlands	**173.03**	**0.73%**
Salt marshes	173.03	0.73%
Grand Total	**23778.00**	**100.00%**

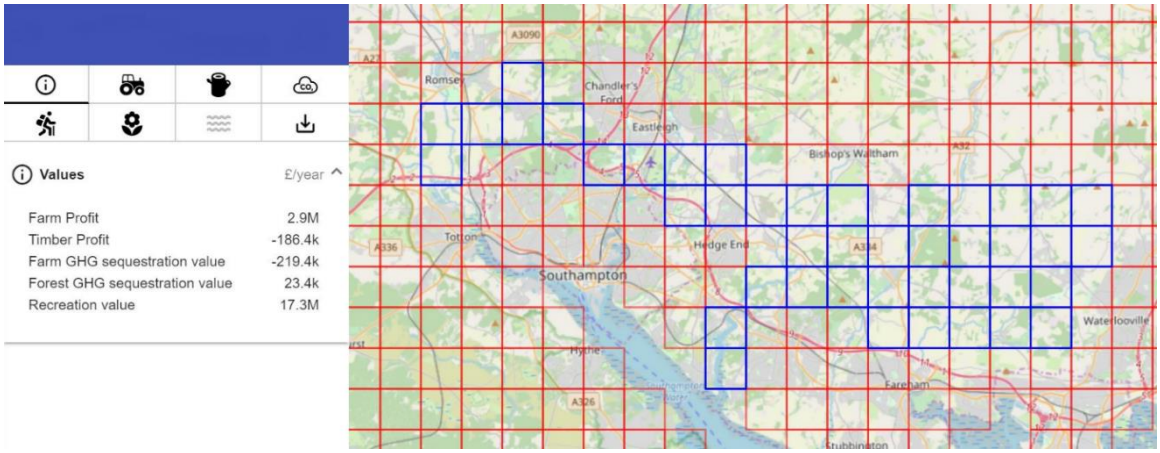
While the ESD provides an overview of the wide range of potential environmental effects and benefits, it is important to note it is not, in their words, 'intended to be a definitive or exhaustive typology'.[5] The values and proxies used to estimate natural capital come with limitations and therefore should only be considered indicative. Nevertheless, they offer insights into the value of the ecosystem services provided by the proposed Green Belt site, something which is potentially at risk if developed.

The provisioning, regulating, and cultural ecosystem services included in this model are discussed in the next sections. Supporting services, such as nutrient cycling, are not included in this model due to the complexity of valuing such ecosystem services. While not valued in monetary terms, supporting services' critical (and highly valued) ecological function are important to consider. For example, in this case, the potential for a Green Belt to provide part of the solution for the nitrates problems currently observed in the Solent.[63]

Provisioning services

This model focuses on one provisioning service: agricultural production. We used the University of Exeter's Natural Environment Valuation Online (NEVO) tool to estimate value.[64] This tool brings 'together spatially explicit data, natural science and economic models to provide insights into the integrated relationships between climate change, land use change, ecosystem service flows and economic values'.[65] The Green Belt area is estimated using the 2km grid found in the tool (Figure 5.2). From this, the NEVO model estimates an annual farm profit of £2.9 million.[66]

Figure 5.2. Approximate area used to estimate agricultural production from NEVO tool



Due to a lack of available data, timber and water abstraction were two provisioning services not considered in the ecosystem services model. However, it is important to acknowledge these services provided by the Green Belt, especially when contrasted with built, developed land.

Regulating services

Three regulating services were included in the model: air pollution removal, carbon sequestration and flood mitigation. For the value of air pollution removal, we use the financial values per hectare for different land cover taken from the Office for National Statistics (ONS) study *Developing estimates for the valuation of air pollution removal in ecosystem accounts*.[67] Carbon sequestration was valued per hectare for four relevant land-use types (semi-natural grassland, heathland, woodland, salt marsh). Annual carbon sequestered tonnage per hectare for woodland was taken from the ONS's *UK natural capital: ecosystem accounts for freshwater, farmland and woodland* (5.4 tonnes/ha).[68] The price of a tonne of carbon was taken from the Department of Business, Energy, and Industrial Strategy's central scenario for short-term traded carbon values, £12.76 £/tCO2e.[69] Financial values for salt marsh, heathland, and enclosed farmland were taken from the Defra study, *Developing ecosystem accounts for protected areas in England and Scotland*.[70] Flood mitigation values

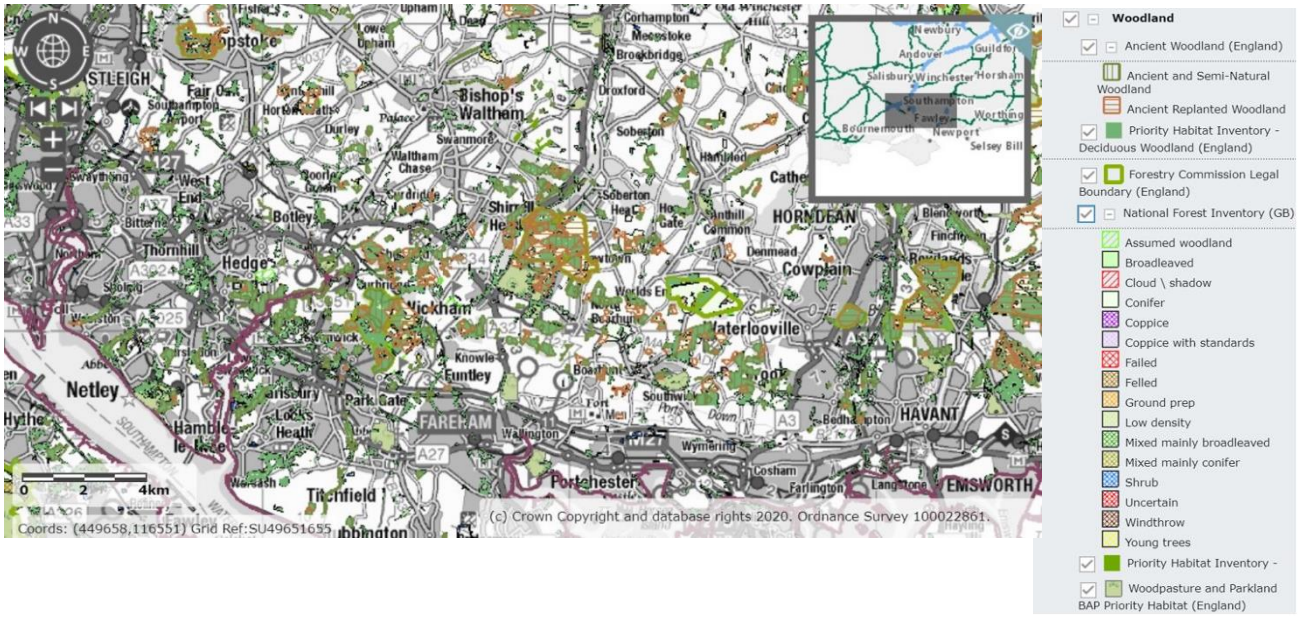
for hectares of woodland were taken from Forest Research's *Valuing flood regulation services of existing forest cover to inform natural capital accounts* and valued at £89/ha/pa.[71]

One important regulating service not covered in the model is pollination. Like water abstraction and timber, there is insufficient data available to estimate the value in the Green Belt. Furthermore, effective financial proxies are difficult to develop for the service. However, it is important to acknowledge these services provided by the Green Belt, especially when contrasted with built, developed land.

Cultural services

Other sections of the report touch on cultural services provided by the Green Belt (eg wellbeing and recreation). To complement that value, we included the non-use value of biodiversity (we define this as distinct from the wellbeing gained from living within the greenspace as discussed previously). Generally, non-use value here means a value not associated with either direct or indirect use, but the value of knowing it is there. For this model, we used the annual monetary values per hectare taken from two studies. For ancient semi-natural woodland, we used a proxy developed in the ESD that uses valuations from a Forestry Commission report, *The Social and Environmental Benefits of Forests in Great Britain.*[72] For other land use types, we use the Defra study *Economic Valuation of the Benefits of the UK Biodiversity Action Plan,*[73] whereby the values for each reflect a 'willingness to pay for enhancements to "charismatic and non-charismatic species", and "sense of place", associated with a significant improvement in habitat condition as a result of full implementation of UK Biodiversity Action Plans'.[74] The four land-cover types included in this model are as follows: ancient semi-natural woodland, native woodland habitat, improved grassland, and lowland heathland. The CLC database does not have an ancient woodland category, so to estimate the amount of ancient woodland in the green space, we used Defra's Magic Map[75] to visually estimate how the proportion of woodland (Figure 5.3 shows a screenshot of this mapping tool). From observing this map, we conservatively estimated the proportion of woodland as ancient as 10%. The remaining 90% we considered as native woodland habitat.

Figure 5.3 Screenshot of Defra's Magic Map presenting woodland type in South Hampshire



Ecosystem service estimations

Table 5.2 presents the ecosystem services model used in this study and the monetary values for each ecosystem service covered. Figure 5.4 presents the values broken down by ecosystem service type.

Table 5.2 Ecosystem service model for proposed Green Belt

	Ecosystem service	Service sub-category	Original value per unit(£)	Unit	Proxy year (£)	Proxy per unit (adjusted for inflation - 2018 prices)	Amount (annual)	Value (£)
Provisioning	Food	Agricultural production	n/a	/ha	2018	n/a		**£2,900,000**
Regulating	Air pollution removal	Rural woodland	£245.00	/ha	2012	£271.78	5178.06	**£1,407,285**
		Enclosed farmland	£14.00	/ha	2012	£15.53	3032.97	**£47,103**
	Carbon sequestration	Heath and montane	£6.30	/ha	2012	£6.99	712.57	**£4,980**
		Semi-natural grassland	£35.82	/ha	2012	£39.74	14522.64	**£577,058**
		Salt marsh	£46.80	/ha	2012	£51.92	173.03	**£8,983**
		Woodland	£68.90	/ha	2018	£68.90	5178.06	**£356,789**
	Flood mitigation	Flood water storage	£89.00	/ha	2018	£89.00	5178.06	**£460,848**
Cultural	Biodiversity (non-use value)	Ancient semi-natural woodland	£1,564.00	/ha	2010	£1,799.71	712.57	**£68,876**
		Lowland heathland	£84.00	/ha	2010	£96.66	517.81	**£931,900**
		Native woodland habitat	£72.00	/ha	2010	£82.85	4660.26	**£386,107**
		Improved grassland	£8.00	/ha	2010	£9.21	14522.64	**£133,691**
							Provisioning	**£2,900,000**
							Regulating	**£2,863,046**
							Cultural	**£1,520,574**
							Total	**£7,283,620**

Figure 5.4. Breakdown of annual ecosystem service value by service type

In total, the value of ecosystem services currently provided by the proposed Green Belt is estimated as **£7,283,620** per year, with approximately half of this value deriving from its regulating services (carbon sequestration, air pollution removal, and flood mitigation). Looking at benefits beyond annual value, it is possible to discount future value by using the NPV technique. HM Treasury's *The Green Book: Central Government Guidance on Appraisal and Evaluation*[76] provides guidance on discount rates to use. Using the Standard STPR outlined in this guidance, we can estimate the NPV for the ecosystem services covered in this section as £192,107,360 over the next 60 years.[15]

[15] The discount value is 3.5% for the first 30 years and 3% for the remaining 30 years.

CONCLUSION

This report explores how to value the benefits of the South Hampshire Green Belt by looking at the impacts associated with the three outcome categories: (1) health and wellbeing, (2) economic (recreation and tourism), and (3) ecosystem services. It puts in quantifiable terms, values not often appreciated in discussion around development on green space and countryside. The motivation behind doing so is to ensure that all impacts are considered by policy- and decision-makers. This report focuses on the Green Belt in its current state and what could potentially be lost from the development of built land. As outlined, it only focusses on net benefits associated with the Green Belt for health and wellbeing. It is hoped by developing this language around valuing aspects of the Green Belt, those advocating to protect these aspects are better equipped to articulate the benefits of the area. As the values estimated from this report show, strong arguments can be made for the value of health and wellbeing, recreation and tourism-related economic activity, and ecosystem services associated with the proposed Green Belt. It is important that this value is considered by planning authorities when addressing challenges such as growing housing demand and that by considering development on other land, particularly on previously developed land, it can potentially conserve this value.

There are several limitations with the analysis that need to be acknowledged:

- Availability of contextually specific data.
- Acknowledged challenges of valuing social outcomes such as wellbeing and environmental impact such as ecosystem services.
- Approximation of the proposed Green Belt.
- Due to data and resource limitations, exploring the case for urban development was outside the scope of this project.

To further the case for a South Hampshire Green Belt, we recommend additional research, in particular more comparative work, comparing specific parts of the Green Belt with specific proposed developments. Furthermore, contextualising the valuation estimates would add depth to the valuation assessments – ensuring the local area and socioeconomic status of the population in South Hampshire are considered. This could be achieved through stakeholder engagement with decision-makers, local organisations, and residents, allowing us to make stronger arguments about the value of a Green Belt.

ENDNOTES

[1] CPRE Hampshire. (n.d.). Green Belt for South Hampshire. Retrieved from https://www.cprehampshire.org.uk/our-campaigns/green-belt-for-south-hampshire/

[2] HM Treasury. (2018). *The Green Book: Central Government Guidance on Appraisal and Evaluation*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[3] White, M.P., Pahl, S., Wheeler, B.W., Depledge, M.H. & Fleming, L.E.(2017). Natural environments and subjective wellbeing: Different types of exposure are associated with different aspects of wellbeing. *Health & Place, 45, 77–84.*

[4] Williams, C. & Davies, W. (2019). Valuing the ecosystem service benefits of kelp bed recovery off West Sussex. Sussex Inshore Fisheries and Conservation Authority. Retrieved from https://www.researchgate.net/publication/335978121_Valuing_the_ecosystem_service_benefits_of_kelp_bed_recovery_off_West_Sussex

[5] Defra. (2020). Enabling a Natural Capital Approach (ENCA). Retrieved from https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance

[6] UK Government. (2012). National Planning Policy Framework. Retrieved from https://www.gov.uk/guidance/national-planning-policy-framework/13-protecting-green-belt-land

[7] House of Commons Library. (2019). Green Belt, Briefing Paper, Number 00934. Retrieved from https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN00934

[8] CPRE Hampshire. (2018). *The state of the Green Belt.* Retrieved from https://www.cpre.org.uk/resources/state-of-the-green-belt-2018/

[9] Song, Y. (2005). Smart growth and urban development pattern: a comparative study. *International Regional Science Review, 28, 239.*

[10] CPRE Hampshire. (2019). Planning for a South Hampshire Green Belt. Retrieved from https://www.cprehampshire.org.uk/wp-content/uploads/sites/3/2019/11/Planning-for-a-South-Hampshire-Green-Belt.pdf

[11] Ibid.

[12] Partnership for Urban South Hampshire. (2017). South Hampshire Green Infrastructure Strategy (2017-2034). Retrieved from https://www.push.gov.uk/wp-content/uploads/2018/08/South-Hampshire-GI-Strategy-2017-2034-FINAL.pdf

[13] Campaign to Protect Rural England (CPRE) and Natural England. (2019). Green Belts: a greener future. Retrieved from https://www.cpre.org.uk/resources/green-belts-a-greener-future/

[14] CPRE Hampshire. (2018). The case for a South Hampshire Green Belt. Retrieved from https://documents.hants.gov.uk/hampshire2050/evidence/theme-4-environment-and-quality-of-place/submitted-evidence/Theme-4-The-Case-for-a-South-Hampshire-Green-Belt-Campaign-for-Protection-of-Rural-England.pdf

[15] Michaelson, J. *et al.* (2008). National Accounts of Wellbeing. Retrieved from https://neweconomics.org/uploads/files/2027fb05fed1554aea_uim6vd4c5.pdf

[16] Fields in Trust. (2018). Revaluing Parks and Green Spaces. Measuring their economic and wellbeing value to individuals. Retrieved from http://www.fieldsintrust.org/Upload/file/research/Revaluing-Parks-and-Green-Spaces-Report.pdf

[17] Houlden, V. *et al.* (2017). A cross-sectional analysis of green space prevalence and mental wellbeing in England. BMC Public Health. Retrieved from https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4401-x

[18] Alcock, I., White, M.P., Lovell, R., Higgins, S.L., Osborne, N.J., Husk, K. & Wheeler, B.W. (2015). What accounts for 'England's green and pleasant land'? A panel data analysis of mental health and land cover types in rural England. *Landscape and Urban Planning 142, 38-46*. Retrieved from http://dx.doi.org/10.1016/j.landurbplan.2015.05.008

[19] Ward Thompson, C., Aspinall, P. & Roe, J. (2014). Access to Green Space in Disadvantaged Urban Communities: Evidence of salutogenic effects based on biomarker and self-report measures of wellbeing. *Procedia - Social and Behavioral Sciences, 153, 10– 22.* Retrieved from https://core.ac.uk/download/pdf/82002938.pdf

[20] Houlden, V., Porto de Albuquerque, J. Weich, S. & Jarvis S. (2019). A spatial analysis of proximate greenspace and mental wellbeing in London. *Applied Geography, 109.* Retrieved from https://www.sciencedirect.com/science/article/pii/S0143622818312384

[21] MacKerron, G., Mourato, S.(2013). Happiness is greater in natural environments. *Global environmental change.* Retrieved from https://eprints.lse.ac.uk/49376/1/Mourato_Happiness_greater_natural_2013.pdf

[22] Alcock, I., White, M.P., Lovell, R., Higgins, S.L., Osborne, N.J., Husk, K. & Wheeler, B.W. (2015). What accounts for 'England's green and pleasant land'? A panel data analysis of mental health and land cover types in rural England. *Landscape and Urban Planning 142, 38-46*. Retrieved from http://dx.doi.org/10.1016/j.landurbplan.2015.05.008

[23] White, M.P., Alcock, I.P., Wheeler, B.W. & Depledge, M. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science, 24(6), 920–928.*

[24] Houlden, V., Weich, S., Porto de Albuquerque, J., Jarvis, S. & Rees, K. (2018). The relationship between greenspace and the mental wellbeing of adults: A systematic review. *PLoS ONE 13(9): e0203000.* Retrieved from https://doi.org/10.1371/journal.pone.0203000

[25] Natural England. (2014). Seeing the wood for the tress, Access to Nature: Early Findings Paper 1.

[26] Greenspace Scotland. (2013). Capturing the changes that count. A review of greenspace Scotland's SROI programmes and projects. Retrieved from https://drive.google.com/file/d/1OgWwOlly8bXpV0u4HnrYKcjVfmJqLML9/view

[27] Morris, J. & Doick K. (2011). The contribution of trees, woods and forests to quality of life. A 'Monitoring & Evaluating Quality of Life' Report.

[28] Mytton, O.T., Townsend, N., Rutter, H., & Foster, C. (2012). Green space and physical activity: An observational study using Health Survey for England data. *Health & Place, 18(5), 1034–1041.*

[29] Twohig-Bennett, C., & Jones, A. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environmental Research, 166, 628–637.*

[30] Coombes, E., Jones, A.P., & Hillsdon, M. (2010). The relationship of physical activity and overweight to objectively measured green space accessibility and use. *Social Science & Medicine, 70(6), 816–822.* Retrieved from doi:10.1016/j.socscimed.2009.11.020

[31] Greenspace Scotland. (2007). Research report. The links between greenspace and health: a critical literature review.

[32] Mitchell, R. & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. *Lancet, 372(9650), 1655-1660.*

[33] Marmot, M. (2010). *Fair Society Healthy Lives (Full Report).* London: The Marmot Review

[34] Holt, A. & Rouquette, J. (2017). The quantification and valuation of the environmental, social and economic impacts of the Forest of Marston Vale. Natural Capital Solutions. Retrieved from http://www.naturalcapitalsolutions.co.uk/wp-content/uploads/2017/06/NCS_FoMV-report-final-2.pdf

[35] Partnership for Urban South Hampshire. (2019). South Hampshire Green Infrastructure Implementation Plan. Retrieved from https://www.push.gov.uk/wp-content/uploads/2019/08/South-Hampshire-Green-Infrastructure-Implementation-Plan-June-2019-.pdf

[36] Mytton, O.T., Townsend, N., Rutter, H., & Foster, C. (2012). Green space and physical activity: An observational study using Health Survey for England data. *Health & Place, 18(5), 1034–1041.*

[37] Twohig-Bennett, C., & Jones, A. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environmental Research, 166, 628–637.*

[38] NHS. (2009). Trends in Consultation Rates in General Practice. Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/trends-in-consultation-rates-in-general-practice/trends-in-consultation-rates-in-general-practice-1995-2009

[39] Fujiwara, D,. Kudrna, L., Cornwall, T., Laffan, K., & Dolan, P. (2015). Further analysis to value the health and educational benefits of sport and culture. *Department for Culture, Media and Sport.* Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/446273/Health_and_educational_benefits_of_sport_and_culture.pdf

[40] Curtis, L. & Burns, A. (2019). Unit Costs of Health and Social Care 2019. *University of Kent. Kent Academic Repository.* Retrieved from https://www.pssru.ac.uk/project-pages/unit-costs/unit-costs-2019/

[41] White, M.P., Pahl, S., Wheeler, B.W., Depledge, M.H. & Fleming, L.E.(2017). Natural environments and subjective wellbeing: Different types of exposure are associated with different aspects of wellbeing. *Health & Place, 45, 77–84.*

[42] Ibid.

[43] Ng Fat, L., Scholes, S., Boniface, S., Mindell, J. & Stewart-Brown, S. (2017). Evaluating and establishing national norms for mental wellbeing using the Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS): findings from the Health Survey for England. *Quality of Life Research*, *26(5), 1129-1144*

[44] White, M.P., Pahl, S., Wheeler, B.W., Depledge, M.H. & Fleming, L.E.(2017). Natural environments and subjective wellbeing: Different types of exposure are associated with different aspects of wellbeing. *Health & Place, 45, 77–84.*

[45] White, M.P., Alcock, I.P., Wheeler, B.W. & Depledge, M. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science, 24(6), 920–928.*

[46] HM Treasury. (2018). *The Green Book: Central Government Guidance on Appraisal and Evaluation*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[47] Oxford Economics. (2016). The impact of heritage tourism for the UK economy. Retrieved from https://www.heritagefund.org.uk/sites/default/files/media/research/20160927_-_the_impact_of_heritage_tourism_on_the_uk_economy_-_final_repo.pdf

[48] National Parks. (n.d.). The impacts of tourism. Retrieved from https://www.nationalparks.uk/students/ourchallenges/tourism/impactsoftourism

[49] ONS. (2019). UK Natural Capital Accounts 2019. Retrieved from https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapitalaccounts/2019#cultural-services

[50] Natural England. (2014). Microeconomic evidence for the benefits of investment in the environment. Retrieved from http://publications.naturalengland.org.uk/publication/6692039286587392

[51] Partnership for Urban South Hampshire. (2019). South Hampshire Green Infrastructure Implementation Plan. Retrieved from https://www.push.gov.uk/wp-content/uploads/2019/08/South-Hampshire-Green-Infrastructure-Implementation-Plan-June-2019-.pdf

[52] Comley, V. & Mackintosh, C. (2015). The Economic Impact of Outdoor Recreation in the UK: The Evidence. Retrieved from http://sramedia.s3.amazonaws.com/media/documents/7bbac57d-977f-4077-960e-e54ee55b4653.pdf

[53] Sport England. (2014). Active People Survey. Retrieved from https://activepeople.sportengland.org/

[54] Natural England. (n.d.). People's engagement with nature. Retrieved from https://defra.maps.arcgis.com/apps/Cascade/index.html?appid=d5fe6191e3fe400189a3756ab3a4057c

[55] Comley, V. & Mackintosh, C. (2015). The Economic Impact of Outdoor Recreation in the UK: The Evidence. Retrieved from http://sramedia.s3.amazonaws.com/media/documents/7bbac57d-977f-4077-960e-e54ee55b4653.pdf

[56] Natural England. (n.d.). People's engagement with nature. Retrieved from https://defra.maps.arcgis.com/apps/Cascade/index.html?appid=d5fe6191e3fe400189a3756ab3a4057c

[57] HM Treasury. (2018). The Green Book: Central Government Guidance on Appraisal and Evaluation. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[58] Williams, C. & Davies, W. (2019). Valuing the ecosystem service benefits of kelp bed recovery off West Sussex. Sussex Inshore Fisheries and Conservation Authority. Retrieved from https://www.researchgate.net/publication/335978121_Valuing_the_ecosystem_service_benefits_of_kelp_bed_recovery_off_West_Sussex

[59] Natural Capital Coalition. (n.d.). What is natural capital? Retrieved from https://naturalcapitalcoalition.org/natural-capital-2/

[60] Guerry, A.D. *et al.* (2015). Natural capital and ecosystem services informing decisions: From promise to practice. *PNAS, 112(24), 7348-7355.* Retrieved from https://www.pnas.org/content/112/24/7348

[61] McKinley, E., Pagès, J.F., Wyles, K.J. & Beaumont, N. (2019). Ecosystem services: A bridge or barrier for UK marine stakeholders? *Ecosystem Services, 37*. https://doi.org/10.1016/j.ecoser.2019.100922

[62] UK Government. (2020). Enabling a Natural Capital Approach. Retrieved from https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance

[63] Natural England. (2020). Advice on Achieving Nutrient Neutrality for New Development in the Solent Region. URL: https://www.push.gov.uk/2020/03/18/natural-englands-latest-guidance-on-achieving-nutrient-neutrality-for-new-housing-development/?utm_source=rss&utm_medium=rss&utm_campaign=natural-englands-latest-guidance-on-achieving-nutrient-neutrality-for-new-housing-development

[64] University of Exeter. (n.d.). Natural Environment Valuation Online tool. Retrieved from https://www.exeter.ac.uk/leep/research/nevo/

[65] ONS. (2019). UK Natural Capital Accounts 2019. Retrieved from https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapitalaccounts/2019#cultural-services

[66] Technical information on how farm profit is calculated in the NEVO model can be found in Fezzi, C. (2019). Natural Environment Valuation Online Tool: Technical Documentation, Chapter 1: Agriculture Model. Retrieved from https://www.leep.exeter.ac.uk/nevo/documentation/

[67] Jones, L., *et al.* (2017). Developing estimates for the valuation of air pollution removal in ecosystem accounts. Final report for Office of National Statistics. Wallingford, NERC/Centre for Ecology & Hydrology, 75pp. (CEH Project no. C06156)

[68] ONS. (2017). UK natural capital: ecosystem accounts for freshwater, farmland and woodland. Retrieved from https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapital/landandhabitatecosystemaccounts

[69] BEIS. (2019). Updated Short-Term Traded Carbon Values. Used for UK public policy appraisal. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794186/2018-short-term-traded-carbon-values-for-appraisal-purposes.pdf

[70] Defra. (2015). Developing ecosystem accounts for protected areas in England and Scotland. Retrieved from http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19271&FromSearch=Y&Publisher=1&SearchText=wc1107&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

[71] Forest Research. (2018). Valuing flood regulation services of existing forest cover to inform natural capital accounts. Retrieved from https://www.forestresearch.gov.uk/research/valuing-flood-regulation-services-existing-forest-cover-inform-natural-capital-accounts/

[72] Wills, K. *et al* (2003). The Social and Environmental Benefits of Forests in Great Britain - Main Report. Report to Forestry Commission. Retrieved from https://forestry.gov.scot/publications/sustainable-forestry/economic-research/665-the-social-and-environmental-benefits-of-forests-in-great-britain-main-report

[73] Christie, M. *et al.* (2011). Economic Valuation of the Benefits of the UK Biodiversity Action Plan. Defra. Retrieved from http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=17272&FromSearch=Y&Publisher=1&SearchText=ne0112&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

[74] HM Treasury. (2018). *The Green Book: Central Government Guidance on Appraisal and Evaluation*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[75] Defra. (n.d.). Magic Map application. Retrieved from https://magic.defra.gov.uk/MagicMap.aspx

[76] HM Treasury. (2018). *The Green Book: Central Government Guidance on Appraisal and Evaluation*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf