EXPLORING THE ECOSYSTEM SERVICE VALUE AND THE IMPLEMENTATION OF AN ECOSYSTEM SERVICE POLICY APPROACH IN A NORTHERN UK CITY.

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Contents

Introduction

Context of the study

The human population is becoming increasingly urbanised. In 2016, the mid-year population estimate (based on Lower Super Output Areas, LSOAs) for England was 55.3 million, of which 83% (45.9 million) lived in urban areas (DEFRA, 2018). This is a global trend with 2008 marking the first time more than half the global population occupied residencies in urban areas. Despite this, we continue to depend on nature for our survival (Bolund, P. and Hunhammar, S., 1999). This reliance comes through something often colloquially described as 'ecosystem services', which translates to "the benefits of nature to households, communities, and economies", though this definition has been adapted many times. The term has gained currency because it conveys an important idea: that ecosystems are socially valuable and in ways that may not be immediately intuited (Daily, 1997). Humans are a component of these ecosystems and in many regions they are the dominant organism. Whether dominant or not, however, humans depend on ecosystem properties and on the network of interactions among organisms and within and among ecosystems for sustenance, just like all other species (Leemans and De Groot, 2003). In recent years, there has been recognition that in order to maximise the benefits attained through ecosystem services, we must first be able to measure their outputs. This has led to the categorisation of services into four main functional groups as displayed below.

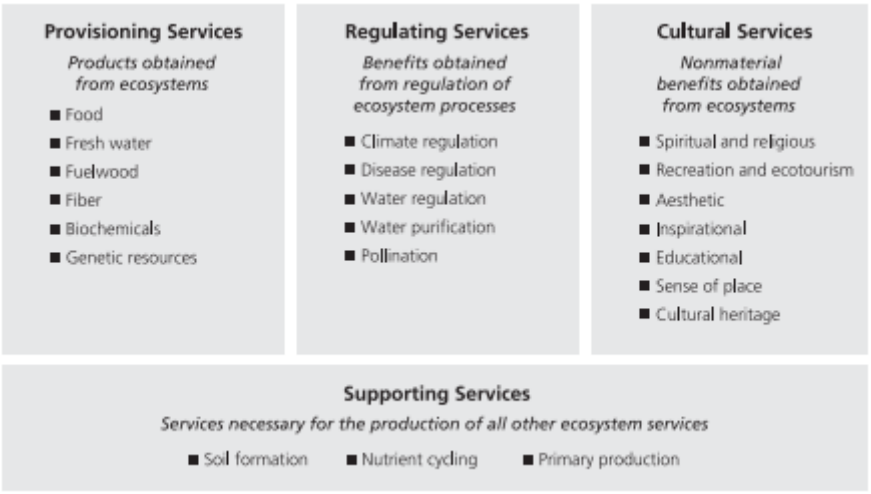

Figure 1: Ecosystem service categorisation (Leemans and De Groot, 2003).

There is no doubt that the quality, quantity and condition of the natural environment surrounding us has a profound impact on quality of all life on earth. Over recent years, much progress has been made towards gaining an understanding of the role of the natural environment in contributing to economic performance. Economists have been looking into ways to articulate market failures evident in our current economic system, displaying significant undervaluation of goods and services within natural realms. The valuation of services across functional boundaries is now widely considered paramount, despite some resistance towards ascribing any tangible value to the natural world for proposed moral reasons. Some fear that the commodification of nature's services may lead to demise although this seems unlikely (Parker and Cranford, 2010). When we buy almost any physical product, we are, in a sense, commodifying nature by signifying our willingness to pay a designated price in exchange for

ownership of natural materials, organisms and their derivatives. Work within the field of environmental economics frequently attempts to illuminate natures' often hidden value - whether it be economic, social, environmental, cultural or spiritual, and whether this value is expressed in qualitative, quantitative or monetary terms. Price and value are not interchangeable; traditional prices almost never reflect the immense value of nature, thus a wedge exists between what a private person does given market prices and what society might want them to do to protect the environment, signifying economic inefficiency. (Hanley et al., 2016).

There is increasing interest in the use of economic valuation of ecosystem services and goods for a wide variety of purposes, including supporting decisions about the allocation of scarce resources from research providers, policy-makers and private sector decision makers alike (Tinch et al., 2019). UK government appear to be gradually embracing approaches that attempt to reduce this wedge between private and public needs, publishing a guide to valuing ecosystem services (DEFRA, 2007) and following with a declaration to 'leave the environment in a better condition than which was previously inherited' (DEFRA, 2011). Since then, a 25-Year plan for the Environment has been released, highlighting that economic growth and the natural environment are mutually compatible and that sustainable economic growth relies on services provided by the natural environment (UK Gov, 2018). The plan is underpinned by the 'Natural Capital approach', a means of identifying and quantifying natural resources and associated ecosystem goods and services that can help integrate ecosystem-oriented management with economic decision-making and development.

Within cities, we depend on the ecosystems beyond the city limits, but also benefit from internal urban ecosystems (Boyd and Banzhaf, 2007). It is now a common association that quality of life in cities depends, among other things, on ecosystem services (ES) generated locally within the cities by multifunctional blue and green infrastructure (Andersson et al., 2015). Liverpool provides an interesting study site as the wider Liverpool City Region (LCR) boundaries not only host a wealth of natural resources but also nationally renowned environmental leadership, and knowledge (i.e. The Mersey Forest; Merseyside Environmental Advisory Service; Lancashire Wildlife Trust). The city of Liverpool is also deemed to be the fourth most deprived area in England (Liverpool City Council, 2015); deprivation levels peak in northern areas where residential neighbourhoods close to the city centre, including substantial parts of Anfield, Kirkdale and Everton wards, fall within the 1% most deprived areas in the country (Urban GreenUp, 2017).

The Urban Green Up diagnosis report, issued in 2017, provides an evidence base for GI interventions in the city of Liverpool to test and demonstrate nature based solutions (NBS). It states that Liverpool's long-term economic and population decline is evident in the economic and social deprivation seen in the city and that as the city's economic fortunes have varied, there has been a corresponding change in the quality of the public open space in the city (Urban GreenUp, 2017). It concluded that green infrastructure (GI) interventions are necessary in Liverpool, offering a multitude of benefits to residents and workers (regarding health, vulnerability, productivity) subsequently resulting in the potential to ultimately improve quality of life within the region. The report also displayed residents within Liverpool were largely supportive of additional green infrastructure (GI). As of 2017, GI coverage across the whole LCR accounted for 62% of total land cover, however it is worth noting that this classifies coastal habitat as GI (24% of the total GI cover) and would increase to 69% if the large areas of the estuary were included (Urban GreenUp, 2017). Despite this, how UGI is distributed varies widely alike other northern urban areas (Ferguson et al., 2018). The north of the city, traditionally the more industrial and deprived areas, have lower levels of green infrastructure than the more affluent central and southern areas (Urban GreenUp, 2017). It has also been an area widely excluded from

recent projects planning to implement GI in LCR, despite benefits of such infrastructure largely outweighing the proposed sites where access to greenspace (often of high quality) is already present.

A brief overview of the methodologies embedded – Strengths and limitations.

The chapters in this study identify and engage two main target groups: key stakeholders/decision-makers within the LCR and the public, generally living within LCR. Chapter 1 explores public value of urban greenspace, applying a willingness to pay (WTP) methodology to elicit values for a cultural ecosystem service – the visual amenity of urban greenspace. This study is conducted within Everton, North Liverpool, a site aforementioned as being a low-income area with low provisions of greenspace. Applying a WTP methodology within an ecosystem service valuation framework has limitations, including frequently over-stated intentions of pay (Christie, 2007), thus any given price should not be taken as absolute. It does however offer an insight into public views of greenspace: the choice experiment (CE) methodology signifies strength in preference to specific attributes of greenery whilst the contingent valuation methodology (CVM) explores participant meta data including socio-demographics and allows room for justification of choices whilst providing ample context to the scenario to reduce limitations commonly associated with CVM studies. The specific site of study is key in its academic contribution; providing WTP data for green infrastructure in a low-income community, where there has not previously been a great deal of research.

Chapter 2 operates within a wider scope. It focusses on the proposed implementation of an ecosystem service type approach (encompassing ecosystem service valuation as explored in chapter 1) within the LCR, the larger economic and political area of England centred on Liverpool, including the study site from chapter 1 and the local authority districts of Halton, Knowsley, Sefton, St Helens, and Wirral. The theme of assessing stakeholder perspectives continues from Chapter 1; however, the emphasis in this chapter is on eliciting views on the implementation of the natural capital approach from informed members of local authorities, developers and other businesses conducting significant operations within LCR. The natural capital approach focuses on the quality and quantity of stocks of natural capital as well as the flows of benefits, meaning it differs from the ecosystem services and cost-benefit analysis approaches which focus solely on the flow of benefits, as such they are inputs to a natural capital approach (eftec, 2019). It is frequently mentioned in the government issued 25-year environment plan as an 'all-encompassing' tool capable of framing environmental challenges, thus relates heavily to pre-existing and future environmental legislation. The ethics of the approach and the semantics surrounding it are contentious topics and it currently carries no statutory weight, thus making the narrative surrounding the approach and its implementation within the LCR an interesting and informative study.

Semi-structured interviews were deemed the most appropriate approach in ascertaining the necessary information to run the study, as we know qualitative data is appropriate for studies determining people's attitudes (Davies et al., 2018). The format of semi-structured interviews allows for the employment of follow-up questions or back tracking to enable respondents to elaborate on their answers, particularly if a point of particular relevance to the study was raised (Foddy, 1994). NVivo, a sophisticated/comprehensive tool for analysis of qualitative data, was used to apply thematic analysis to the interview transcripts so to highlight key themes and/or concepts discussed and allow such analysis to be conducted in a precise, consistent and exhaustive manor. The length and depth of the interview, transcription and analysis process did bring limitations, including a contribution towards limited sample size. One limitation to be mindful of is potential non-response bias: a large proportion

of those contacted directly did not take part, perhaps the subject matter was not perceived as sufficiently salient to respond. However, non-respondents may have had no knowledge of or less positive – even negative – attitudes towards the natural capital approach that haven't been noted in this study. Above all and as previously mentioned, it is key to remember that environmental economics offers only one way to frame environmental challenges.

Project aims

The following chapters identify and engage two main target groups within the LCR: key decision-makers and the public living within LCR. Both are stakeholders within the commentary surrounding green infrastructure within the region. The project broadly aims to explore stakeholder (both public and private) perceptions of urban greenspace within the LCR. It hopes to further the narrative on the application of environmental economics within northern UK cities through implementing ecosystem valuation methodologies within the wider ecosystem service framework. I have taken this opportunity to advance otherwise limited WTP data within low-income communities by choosing a study site in Everton, North Liverpool, ranked amongst the 1% most deprived areas in the country (Urban GreenUp, 2017). The project also looks more broadly at perceptions of an ecosystem service policy approach and the potential for its implementation within the LCR via accessing current knowledge and perceptions from key decision makers within the region. In short, this study broadly looks to generate data fit to inform environmental decision-making within a local, regional and national scale.

The project therefore sets out objectives to:

- Elicit public values and perceptions of urban greenspace through the development and application of a willingness-to-pay choice contingent study in Everton, North Liverpool.
- Fill gaps in research via generating willingness-to-pay data for GI in a low-income community within a northern UK city.
- Assess professional knowledge, perceptions, and the potential for implementation of an ecosystem service policy approach, specifically the natural capital approach, within the Liverpool City Region.
- Provide context to the wider discussion around future changes in environmental legislation, in term informing the decision-making process at varying levels.

Chapter 1 - Valuing the visual amenity of urban greenspace: A choice contingent study at Breckfield Road, Everton, North Liverpool.

1.0 - Abstract

In a world that is urbanizing rapidly, it is of utmost importance that green investment is valued correctly. Cultural ecosystem services are difficult to quantify, meaning they are often over-looked. This leads to poor decision making in the planning process and a lack of green space investment, reducing the benefits of cultural services. A choice contingent valuation study was carried out in Everton, North Liverpool, UK in an effort to derive an economic value of the visual amenity of urban greenspace through a Willingness to Pay (WTP) choice experiment. This choice experiment was partnered with a questionnaire, to provide context to the experiment and allow the participants to justify their choices. The questionnaire includes background/contextual questions including socio-demographics whilst also asking people's perceptions of green investment to distinguish whether or not they think it would benefit the area. All choice experiment data displays statistical significance to 1% and analysis shows a preference to all of the images with additional greenspace in respect to the control (image with no additional green space). Results indicated a preference for the images with both grass verges and street trees, suggesting a correlation between greenness and WTP. The image with small trees and grass verges was found to be the most desirable, with the highest WTP at an average value of £12.21. Survey results indicated that participants showed high positive responses to street trees and grassed areas being part of their ideal views. The study indicates a strong willingness to pay for views of green infrastructure in an area of low economic status.

2.0 – Introduction

As we become more urbanised city green spaces, the network of natural assets (including parks, street trees, highway verges, allotments, forests, watercourses and coastal habitats among others) increasingly become the primary contact people have with nature. These urban natural areas therefore not only help to keep us connected with nature but also provide us with a range of benefits that improve human wellbeing (Barbosa et al., 2007; Wolch et al., 2014). These benefits often referred to as ecosystem services; provide the natural capital, which underpins our economy (Turner and Daily, 2008). The services which come from urban green spaces include regulation of natural processes (regulatory services e.g flood and climate regulation) and provide a range of benefits such as clean water, food (provisioning services), nutrient cycling and pollination services (supporting services) (Bolund and Hunhammar, 1999). It is also widely recognised that contact with urban green space provides a range of cultural services, including perceived improvements in mental and physical health, sense of place, safety, community cohesion and pride within an area (Grimm et al., 2000; Yli-Pelkonen and Niemela, 2005; Maas et al., 2006; Thompson et al., 2012; Keniger et al., 2013; Pope et al., 2015).

Thanks to seminal reports such as the Millennium Ecosystem Assessment (MEA, 2005) and the UK based UK National ecosystem assessment (UKNEA, 2011) there has been increased awareness of the importance of urban green spaces to human wellbeing through the supply of ecosystem services. In the government issued the 25 Year Environment plan (UK Gov, 2018) targets were set surrounding climate change resilience, air quality improvements and clean and plentiful water in the hope of improving the environment within a generation and leaving it in a better state than it was found. The

document states that the provision of more and better quality green infrastructure, including urban trees, will make towns and cities attractive places to live and work whilst bringing about key long-term improvements in people's health. It also notes that better green infrastructure will promote local social interaction and help to develop strong community networks through participation. Numerous studies highlight the health benefits of urban green infrastructure (UGI), including improved mental and physical health (Davdand et al., 2014; McEachan et al., 2015; Pope et al., 2015; van den Berg et al., 2015; Gascon et al., 2016; van den Berg et al., 2016).

This can be especially important in deprived areas as is shown in research by Mitchell & Popham (2008) which indicates these areas have the most to gain from urban greening. They found that health inequalities related to income deprivation in all-cause mortality and mortality from circulatory diseases were lower in populations living in the greenest areas (Mitchell & Popham, 2008). This is supported by recent reports conducted within deprived urban neighbourhoods in the UK, which display a reduction in levels of perceived stress and improved physiological stress as measured by diurnal patterns of cortisol secretion (Thompson et al., 2012; Roe et al., 2013). Despite this, the provision of green space across the UK has declined over the last 3 decades in terms of both condition and accessibility (Davies et al., 2011). Access to green space is unequally distributed within the UK (Davies et al., 2011) with ethnic/racial minorities (Wolch et al., 2005; Heynen et al., 2006; Landry and Chakraborty, 2009) and/or those of lower socio-economic status (Vaughan et al., 2013) often having comparatively less access to and/or worse quality of greenspace provision (Ferguson et al., 2018).

The UK government have highlighted benefits of green space provision on their government website, whilst attempting to explain and offer guidance on how a strategic approach can be taken towards green infrastructure, including how GI can be considered within planning decisions (UK Gov, 2019[1]). Projects looking into how planning can safeguard soils, how brownfield land of high environmental value can be taken into account and what planning goals can green infrastructure help to achieve exemplify the UK Government attempting to move on the narrative of GI within UK planning policy. The common theme here is that we must first understand the values people place on GI, to inform decision-making, hence the development of a Natural Capital approach as highlighted in the 25-Year Environment plan and the revised National Planning Policy Framework (UK Gov, 2018; UK Gov, 2019[2]). This approach can be seen as an effort to understand and quantify ecosystem services in the hope they will then be considered within the decision-making process.

There is still much work to be done, as the ecosystem services that come from green space are undervalued under a capitalist market economy. Like most ecosystem services, many of those that come from green space are non-market commodities and services (Costanza et al., 1997; Fisher et al., 2009; De Groot et al., 2012). This means that their values are not readily captured by markets, so are not accounted for within the current economic model and are therefore under-valued. This leads to poor decision making in terms of green space planning and investment. To address this there has been a recent drive within the sustainability sector to use environmental economic methods to place an economic value on these services (Garrod et al., 2009; Mell et al., 2013). When such benefits are valued in monetary terms, this can help stakeholders and policy makers to understand their contributions, justify resources and improve decision-making (Jim and Chen, 2006[1]).

Visual aesthetic is a key cultural service (Selman, 2009). Views that incorporate flora are thought to create positive feelings, reduce fear, hold attention, improve mood and stimulate reflection and recovery from mental fatigue and illness (Ulrich, 1984; Pretty et al., 2016). Views of nature have also been found to improve quality of place, sense of civic pride and community cohesion (Lund, 2003; Northwest Regional Development Agency and Natural England, 2008). However cultural services (such as the visual amenity of greenspace) have been said to be the hardest to place a value to given their

qualitative meaning to people (Boyd and Banzhaf, 2007). Skärbäck's research (2007) supports this argument, stating that the link between vegetated space and mental/physical recovery and well-being is definitely present although the subtlety and complexity of linkages are very hard to clearly define. Cultural services are consistently recognized and aside from recent efforts by Andersson-Sköld et al., (2018) they are not yet adequately integrated within the ecosystem services framework (Daniel et al., 2012). Deriving quantitative data from cultural services is a difficult task.

Stated preference methods are a series of approaches or methods used to estimate the value of goods and services not commonly bought and sold in existing markets (Vega and Alpizar, 2011). Therefore, they may be utilized to estimate values not intimately linked to usage, i.e. the desire of individuals to pass on pristine natural environments to future generations (Mitchell and Carson, 1989). Typically, a stated preference method implies the simulation of a market where a good, or a bundle of goods, is offered at a given price, although other variants are possible. As they concentrate on the valuation of a particular scenario that presents potential quality changes; environmental or otherwise, this means researchers must provide adequate information about the scenario for the respondent to judge a fixed quality change. In this case the simulated market is described in a questionnaire given to a sample of the relevant population where respondents "state" their preferences and practitioners apply a statistic procedure to estimate the representative maximum willingness to pay (WTP) of the respondents (Mogas et al., 2009). Stated preference methods (Garrod et al., 2009; Mogas et al., 2009; Mell et al., 2013) can be divided in two groups, the contingent valuation method (**CVM**/**CV**), with its many variants (Mitchell and Carson 1989), and choice modelling (**CM**), which includes contingent ranking, contingent rating and choice experiments (**CE**) (Louviere et al., 2000; Bennett and Blamey, 2001; Hanley et al., 2001; Bateman et al. 2002). Practitioners normally obtain primarily discrete values when applying contingent valuation methods and marginal values from choice experiments or other choice modelling methods (Mogas et al., 2009). Marginal values differ from discrete values, as they are the change in a value associated with a specific change in some independent variable. A discrete value can be a singular numeric or categorical value - like red or blue, male or female, or good or bad. It is possible to obtain discrete values from choice experiments; however, this typically raises a number of problems, primarily in relation to the scale parameter (Mogas et al., 2009). These limitations have led some authors to believe that contingent valuation methods are more suitable to estimate discrete values while choice experiments are best for marginal values or relatively small discrete changes (Hanley et al., 2001; Alpizar et al., 2003; Bateman et al., 2002) and if this belief is correct, then the combination of both methods may sometimes be beneficial.

Choice experiments are often offered as a tool to assign monetary values to environmental externalities (Vega and Alpizar, 2011). Unlike in CVM's where respondents can be asked to state their individual WTP or say yes or no to a given cost for the provided good, in choice modelling respondents are presented with several alternatives, each one being described by a number of attributes or characteristics. The respondent is then asked to choose between these different consumption bundles. They allow the creation of hypothetical but realistic scenarios for consumers, making them a flexible tool (Powe et al., 2005). CE's have been particularly effective when combined with a questionnaire (Campbell et al., 2009; Garrod et al., 2009). Depending on the specific choice modelling method, respondents are asked to state the most preferred alternative of the choice set (choice experiment), rank them (contingent ranking), or rate them (contingent rating). The different bundles present choices to people directly whilst the questionnaire explains the choice options and their impacts alongside any other relevant information including specifics for each study.

Through a stated preference design it is possible to combine both direct questions such as willingness to pay (WTP), notably associated with contingent valuation studies, with choice modelling (offering

different consumption bundles) allowing an accurate economic valuation method suitable for estimating both use and non-use values. The combination of CE and post-questionnaire analysis enables researchers to test the adequacy of the valuation process used; explore the public acceptability of the valuation exercise; gain a better understanding of how respondents perceive and deliberate the specific good value whilst acquiring a better awareness of respondents thought processes and motivations behind their responses. In a study investigating the adequacy and public acceptability of a stated preference method which used post-questionnaire analysis to look at the effectiveness of a CE (Powe et al., 2005) it was found that the specifics of scenario and design choices reduce problems of charity like (Christie et al., 2007) and bid-realism/fair share responses, thus preventing the frequent overstating of pay. Powe et al., (2005) also highlighted significant sensitivity to characteristics of goods and identified that participants found trade-offs between environmental quality, service and cost relevant and that most responses to the methodology reflected a balance between these (Powe et al., 2005). The use of post-questionnaire qualitative analysis did endorse the approach but it would be recommended that serious consideration is required regarding the presentation of information (including the use of visual or other communication aids) including an explanation of the role of respondents within the decision making process and selection of range of environmental attributes considered.

This study seeks to address issues of greenspace being undervalued and alleviate difficulties in quantifying cultural services by using a willingness to pay scheme to ask members of the public to assign a value to the visual amenity of urban greenspace, specifically street trees and grass verges. To reduce limitations through fault of design, this study utilises stated preference methods, in the form of a choice experiment with post-questionnaire analysis to provide an economic value for the visual amenity of urban greenspace alongside additional context. The paper aims to inspire improvements through decision making in the planning process and highlight the need for green space investment to deliver the benefits of cultural services.

3.0 – Methodology

A willingness to pay choice experiment (CE) was used to derive an economic value of the visual amenity of various options of street green infrastructure in North Liverpool, UK. The approach, using images of a street with and without additional green space to create the choice experiment, was developed based on previous studies (Garrod et al, 2009; Mell et al., 2013).

The various options for views were created through editing of a photograph of Breckfield Road Everton, Liverpool; with alternative options of green infrastructure created using the software Vis2D. Options for green infrastructure are:

1. Small trees;
2. Small trees and grass verge;
3. Large trees;
4. Large trees and grass verge.

The images were associated with the additional cost of living with this view (Garrod et al., 2009) which is hypothetically paid in monthly instalments via additional council tax. This was proposed as a suitable approach because:

1. Residents within Liverpool (and England) are familiar with council tax and the majority pay;
2. It is a cost that people can interpret against their perceptions of local service provision;

3. It would draw both positive and negative responses, as participants are likely to have formed opinions on council tax charges;
4. Regular or monthly payments potentially elicit a more realistic WTP value than a one-off payment.

The choice experiment (CE) with an orthogonal design was created using the software Ngene. Participants were shown three images of Breckfield Road six times on a tablet. Each rotation set initially displaying a control variable, offering no additional greenspace with no additional cost per month. The other two images in the rotation having additional greenspace. Alongside these images is a randomly generated value, displayed according to the orthogonal design. This varied from £0- £12 per month at intervals of £2. Values were selected to be similar to those used by Mell et al., (2013) which was carried out in another city in the Northwest of England. An example of one rotation is displayed in figure 6 below.

The choice experiment was conducted with 90 participants via face-to-face surveys at various sites in North Liverpool, which are as followed:

1. Breck Road Community Library - Breck Road, Everton Liverpool L5 6PX;
2. The Breckfield Centre (a community centre) - Breckfield Road North, Everton, Liverpool L5 4QT;
3. Everton Park Lifestyles fitness centre - Great Homer Street, Everton, Liverpool L5 5PH.

A multinomial logit regression was ran using the software Limdep to analyse the choice experiment data. This first calculated the coefficient of both the images and costs (strength of preference towards the images). Then using Limdep, a WALD test (an adaptation of manual accuracy simulation called Krinsky & Robb procedure (Krinsky and Robb, 1986)) was ran which indicated people's preference for the images traded off against the cost by dividing the image coefficient by the cost coefficient (see table 1 in results section). The model then uses these points of reference in relation to the control (no additional green space with a fixed value of £0) to build the model that predicts the Willingness to Pay (how much extra people are willing to pay to have each view), offered as a marginal value or MRS (marginal rates of substitution). Further regressions were then ran to show how demographic variables including participant age, the level of education reached and income affected their views on the images.

Respondents were asked about their general views on green space and to justify their choice experiment selections in a questionnaire, adapted from Garrod et al., (2009) and Mell et al., (2013). The aim was to provide context to the experiment and explain any heterogeneity in valuations. The questionnaire, located in the appendices (section 8.1), includes background/contextual questions including socio-demographics, the data for which is displayed in the appendices section (8.7) under the title 'Personal questions'. This questionnaire aims to identify perceptions of green investment (GI) and the results section is laid out in concordance with the format of the questionnaire.

Figure 2: Image 0 - control variable - Breckfield Road street view with no additional greenspace.

Figure 3: Image 1 - Breckfield road with additional small trees (upright branching cherry tree).

Figure 4: Image 2 - Breckfield road with additional grass verges and small trees (upright branching cherry tree).

Figure 5: Image 3 - Breckfield road with additional large trees (Lime trees).

Figure 6: Image 4 - Breckfield road with additional grass verges and large trees (Lime trees).

024 - Choice 1 0

Additional cost per month - £0

024 – Choice 2 3

Additional cost per month - £4

024 – Choice 3 2

Additional cost per month - £8

Figure 7: Example of a singular rotation, based on the orthological design format – Each respondent was asked to rank the images from best to worse.

4.0 – Results

The following section explores attitudes to green space, both locally and non-locally, through eliciting key information linked to preference for views, choice experiment rationale, greenspace usage and demographics.

4.1 - Section A – Where you currently live…

This section highlights participants' attitudes towards greenspace in their local area through prompting key factors in determining a good place to live and comparing how this aligns with their current living situations.

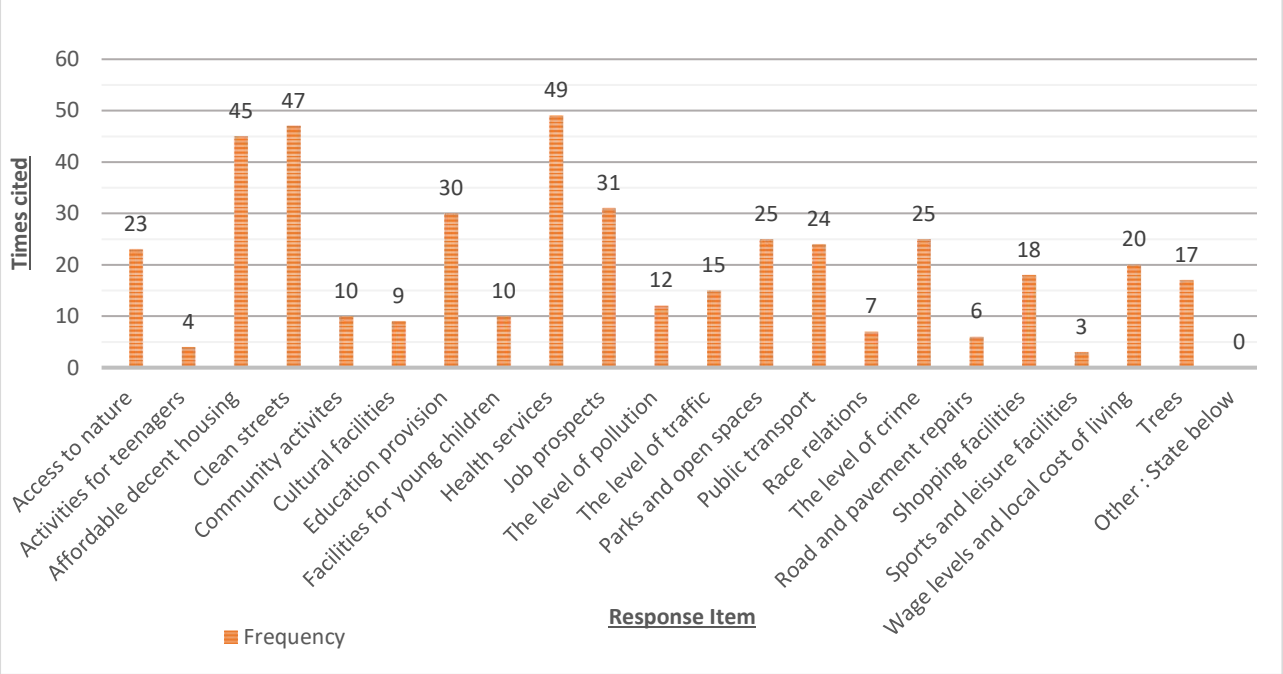

Figure 8: A bar chart displaying the frequency of responses to question 1 from the survey - Which of these things would you say are most important in making somewhere a good place to live? - Multiple-choice answer (up to 5 only).

Health services (49), clean streets (47) and affordable decent housing (45) were selected most regularly, indicating they were deemed the most important elements in making somewhere a good place to live. Job prospects (31), education provision (30), the level of crime (25) and parks and open spaces (25) were also regarded as important factors. Access to nature (23) and trees (17) were selected more frequently than community activities (10), cultural facilities (9) and the level of pollution (12) but not ranked amongst the most important factors in making somewhere a good place to live.

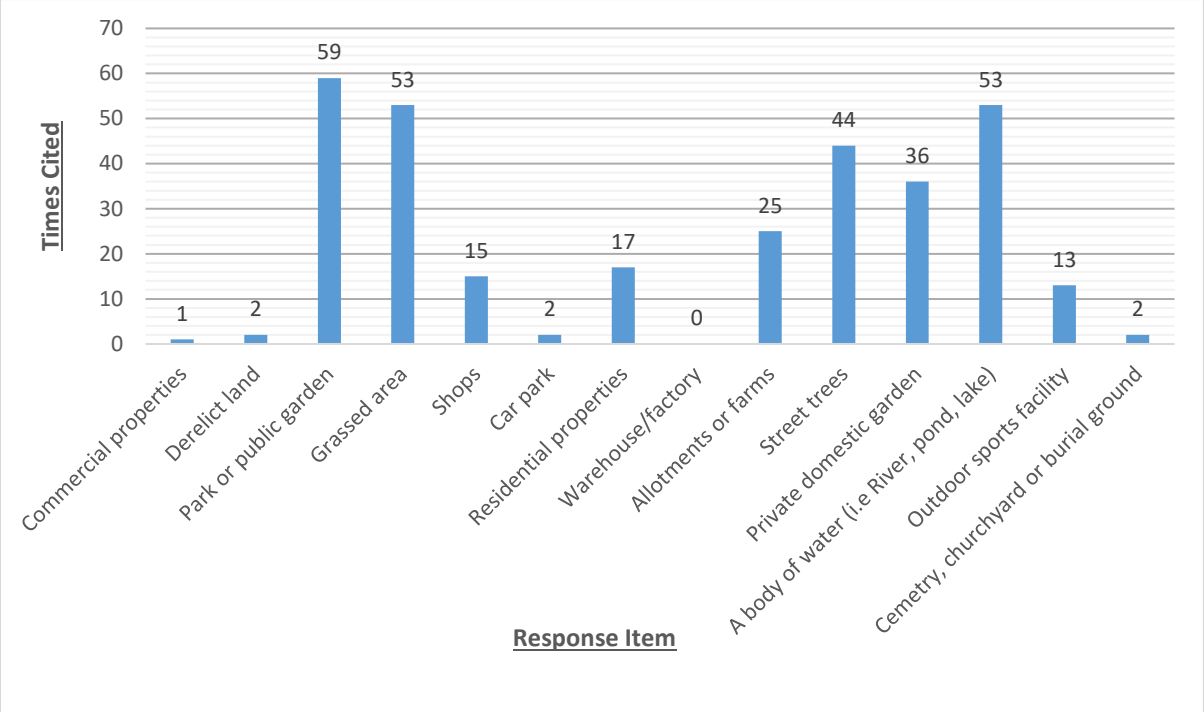

Figure 9: Frequency of responses from question 2A from the survey - From the list below, which of the following features would you expect to see in a landscape with your ideal view? (Multiple-choice).

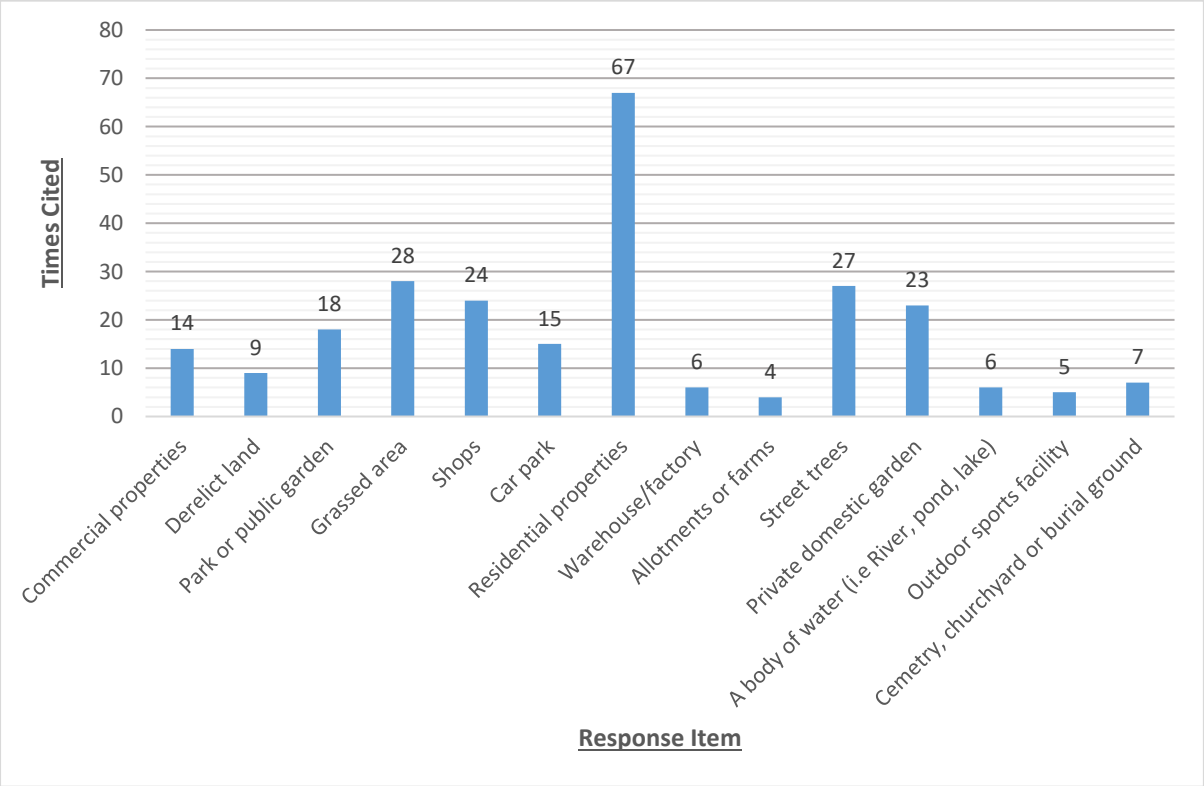

Figure 10: Frequency of responses from question 2B - From the list below, which of the following features can your see from your current property? (Multiple-choice).

There is disparity between what features participants would like to see in a landscape with their ideal view (figure 8) and what features are currently visible from their residences (figure 9). 59 people included a park or public garden in a landscape with their ideal view but only 18 could currently see one from their property. 53 participants included a grassed area in their desired landscape and another 53 chose a body of water yet only 28 participants currently viewed a grassed area and 6 a body of water. 44 people wished for a view with street trees whilst 27 could currently view them from their property. Only 17 people wanted to view residential properties whilst 67 participants could from their current property.

4.2 - Section B – Greenspace usage

This section focuses on usage of greenspace, both local and non-local.

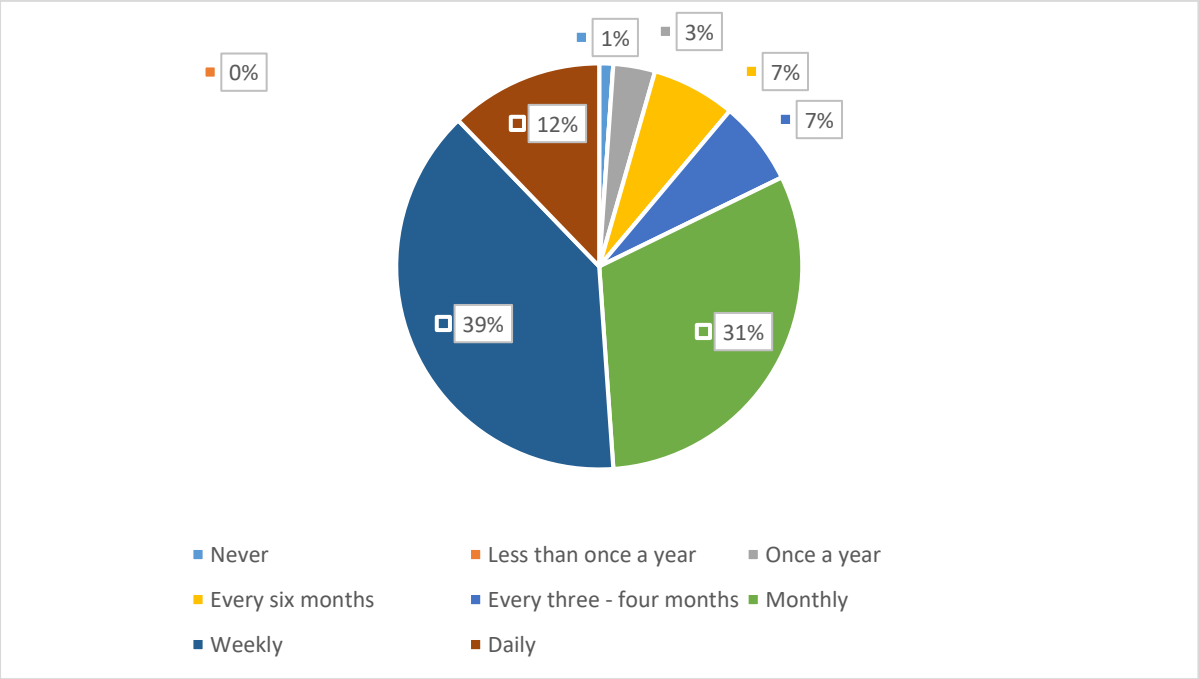

Figure 11: Responses to question 3 in percentages - On average, how often do you make recreational visits to green spaces in your local area?

38.89% of participants stated they make weekly recreational visits to green spaces in their local area, whilst 31.11% visit monthly. Only 12.22% make daily visits, whilst 3.3% only visit once a year.

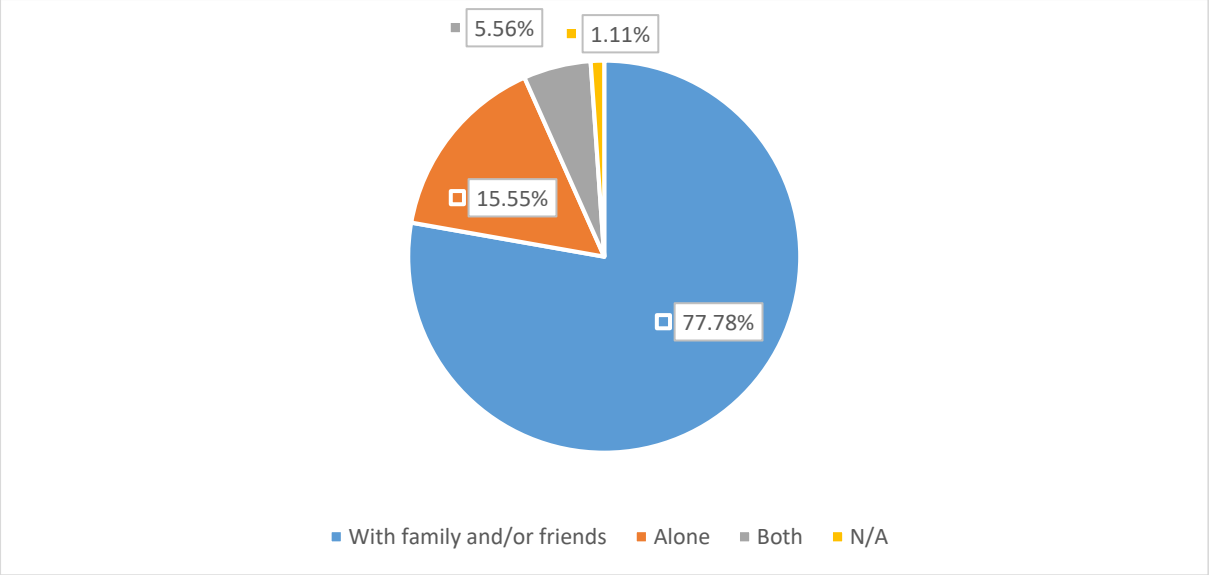

Figure 12: Responses to question 4 in percentages - Do you normally visit these green spaces alone or with family and friends?

A vast majority (77.78%) of participants visited local green spaces with family and friends. Only 15.55% made the trip alone.

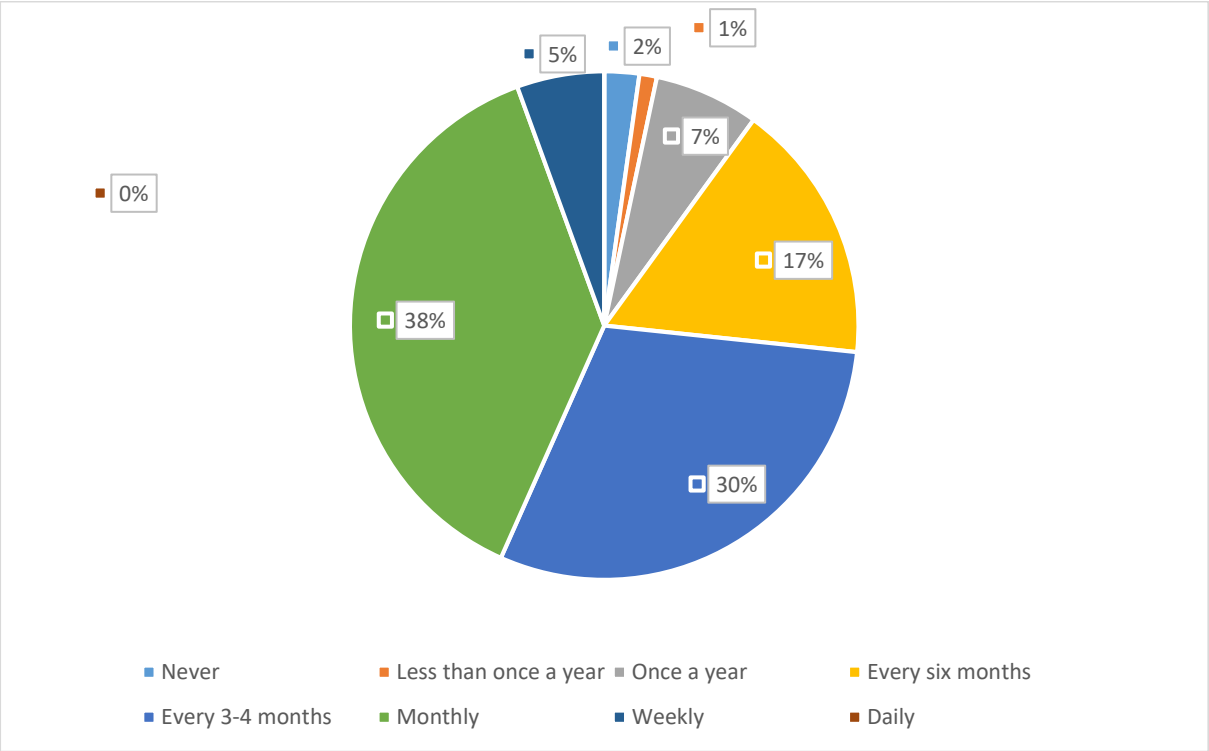

Figure 13: Responses to question 5 in percentages - In a typical year, how often do you make recreational visits to green areas outside of your local area (i.e countryside, coast, woodlands, farms etc...)?

38% of respondents visited green areas outside of their local area monthly, whilst 30% made the trip every 3-4 months. 5% took a weekly trip and 7% went once annually. Only 1% travelled less than once a year and 0% made the trip daily.

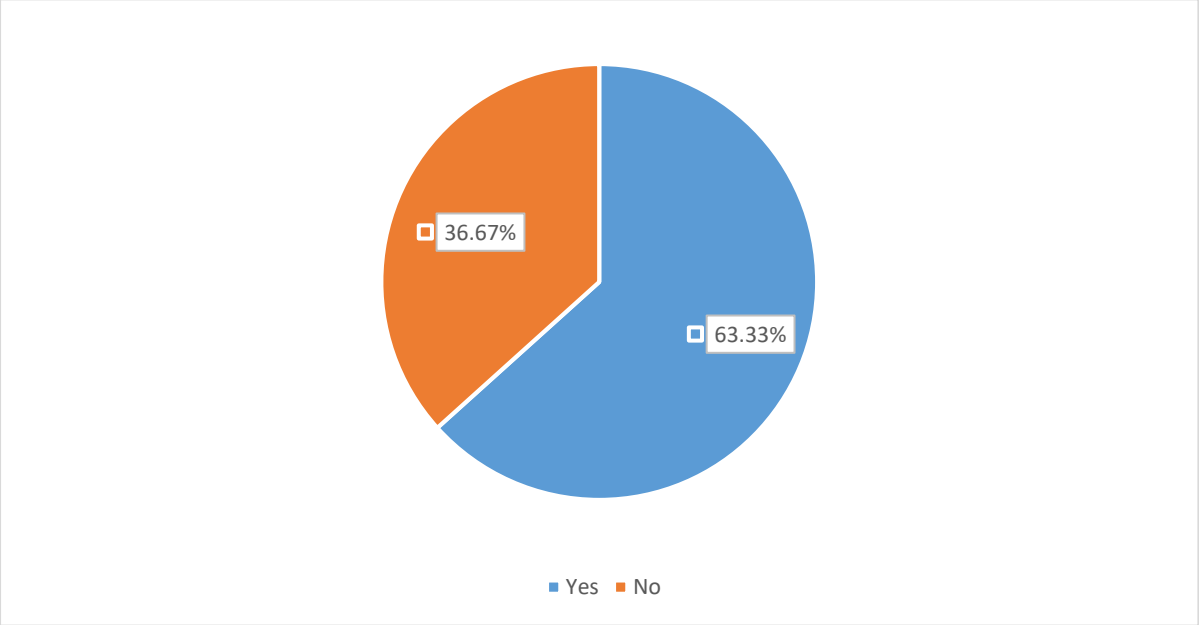

Figure 14: Responses to question 6A in percentages - Does your house or apartment have a garden?

The majority (63.33%) of participants have a garden.

4.3 - Section C - Liverpool green valuation MNL model summary results

Section C displays data from the WTP choice experiment, indicating preference towards views of greenspace and exploring how demographic variables affect this preference.

Table 1: Choice experiment responses (multinomial logit model results).

Preference Parameters					
	Coefficient (B)	Std. err	*z*	*p-value*	95% Confidence interval
Image_1 – Small trees.	3.29332***	0.30302	10.87	0.0000	2.69942, 3.88722
Image_2 – Small trees & grass verges.	5.27665***	0.35513	14.86	0.0000	4.58060, 5.97270
Image_3 – Large trees.	3.51307***	0.27757	12.66	0.0000	2.96905, 4.05710
Image_4 – Large trees & grass verges.	4.90861***	0.35522	13.82	0.0000	4.21239, 5.60482
Cost	-.43210***	0.03174	-13.61	0.0000	-0.49431, -0.36990
Willingness to Pay (£)					
	WTP (W)	Std. err	*z*	*p-value*	95% Confidence interval
Image_1 – Small trees.	7.62162***	0.45599	16.71	0.0000	6.72789, 8.51535
Image_2 – Small trees & grass verges.	12.2116***	0.54994	22.21	0.0000	11.1337, 13.2894
Image_3 – Large trees.	8.13019***	0.52393	15.52	0.0000	7.10331, 9.15707
Image_4 – Large trees & grass verges.	11.3598***	0.49890	22.77	0.0000	10.3820, 12.3376

Note: ***, **, * Significance at 1%, 5%, 10% level respectively. Pseudo R-squared = 0.35817.
Model predicted 35% of variability in the prices/choices – high for this regression as the independent variable is a choice.

The average multinomial logit coefficient (± SE) for all images is positive in comparison to the control (image 0) and statistically significant to 1%. The highest image coefficient is for image 2 (small trees and grass verges) at 5.27665*** showing that image 2 was consistently selected as the preferred image in comparison to the control. It boasts a standard error of ± 0.35513 and a 95% confidence interval ranging between 4.58060, 5.97270, with only the upper 95% confidence interval of image 4 at 5.60482 overlapping the parameter. The WTP of image 2 is higher than the values given in the

choice experiment, as these values were experimental figures used to build the model. Its 95% confidence interval ranged from £11.14, £13.29, however it boasted the highest standard error of ± £0.55, showing that although people were willing to pay the highest prices for this view, there is a wider range of valuations associated with this view than any other. The lowest image coefficient is for image 1 (B = 3.29332***) signifying it is the least desirable view other than the control. The average willingness to pay for all images of all images are positive and statistically significant to 1%.

Table 2: The affect demographic variables have on participant's choices (multinomial logit model results).

Preference Parameters					
Choice	Coefficient (B)	Std. err	*Z*	*p-value*	95% Confidence interval
IM1_EDUN (Respondents with university level educations sensitivity to image 1)	-1.41523*	0.76985	-1.84	0.0660*	-2.92411, 0.09365
IM2_EDUN (Respondents with university level educations sensitivity to image 2)	-1.11523	0.91336	-1.22	0.2221	-2.90539, 0.67492
IM3_EDUN (Respondents with university level educations sensitivity to image 3)	-0.70268	0.72856	-0.96	0.3348	-2.13063, 0.72527
IM4_EDUN (Respondents with university level educations sensitivity to image 4)	-0.58692	0.95288	-0.62	0.5379	-2.45453, 1.28070
COST_EDU (Respondents with university level educations sensitivity to the cost of proposed greenspace)	0.04589	0.08475	0.54	0.5882	-0.12022, 0.21201
IM1_INC (The effect an increase in income has on sensitivity to image 1)	0.15255	0.23796	0.64	0.5215	-0.31385, 0.61895
IM2_INC (The effect an increase in income has on sensitivity to image 2)	0.20031	0.28770	0.70	0.4863	-0.36356, 0.76419
IM3_INC	0.21947	0.22651	0.97	0.3326	-0.22448, 0.66342

(The effect an increase in income has on sensitivity to image 3)					
IM4_INC (The effect an increase in income has on sensitivity to image 4)	-0.02700	0.29336	-0.09	0.9267	-0.60197, 0.54797
COST_INC (The effect an increase in income has on sensitivity to the cost of proposed greenspace)	0.01516	0.02613	0.58	0.5617	-0.03605, 0.06637
IM1_AGE (The effect an increase in age has on sensitivity to image 1)	-0.20468	0.24448	-0.84	0.4025	-0.68385, 0.27449
IM2_AGE (The effect an increase in age has on sensitivity to image 2)	-0.36114	0.29196	-1.24	0.2161	-0.93337, 0.21109
IM3_AGE (The effect an increase in age has on sensitivity to image 3)	-0.09879	0.23629	-0.42	0.6759	-0.56190, 0.36433
IM4_AGE (The effect an increase in age has on sensitivity to image 4)	-0.01273	0.29945	-0.04	0.9661	-0.59965, 0.57420
COST_AGE (The effect an increase in age has on sensitivity to the cost of proposed greenspace)	0.01877	0.02648	0.71	0.4784	-0.03313, 0.07066

Note: ***, **, * ==> Significance at 1%, 5%, 10% level respectively. Pseudo R-squared = 0.3772.

The relationship that a respondent's level of education, income and age have with regards to preference to the images is displayed by the coefficient (B) (the strength of preference towards each image (see table 2)). On average participants had a positive preference towards the images with additional greenspace in comparison to the control (table 1).

Education has a slight negative affect on the images coefficients, with image 1 being the only value influenced with significance at 10% (B= -1.41523* ± 0.76985, $p < 0.01$). No other values were significant. Education has no significant impact on sensitivity to cost (B= 0.04589* ± 0.08475, $p > 0.01$).

Income has a slight positive effect on the preference to the images, aside from image 4 which had a slight penalty (B= -0.02700 ± 0.29336, $p > 0.01$), none of which are significant. Income has no significant impact on sensitivity to cost (B= 0.01516± 0.02613, $p > 0.01$).

Age has a slight negative affect on the images coefficients to no significance. It has no significant impact on sensitivity to cost (B= 0.01877 ± 0.02648, $p > 0.01$).

4.4 - Section D – Justifying your choices (Rationale for choices).

This section explains participants' rationale for selections within the choice experiment, providing additional context to their decisions.

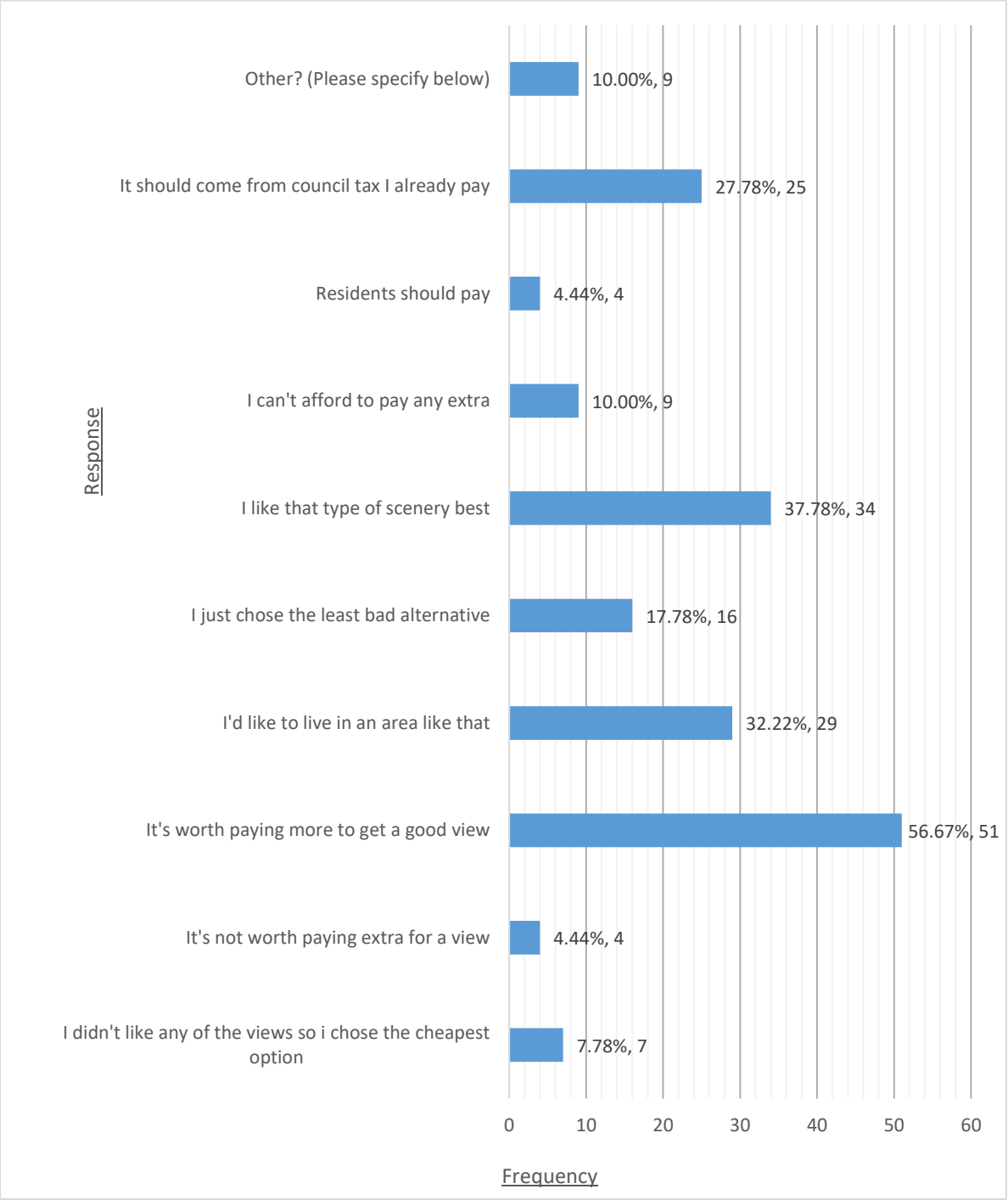

Figure 14: Percentages (first) and frequencies (latter) of responses from question 7A - Which of these reasons best explains your reasoning behind the choices you have made? Multiple-choice answer (up to 3 only).

56.67% of respondents believe it is worth paying more to get a good view whilst only 4.44% think it is not worth paying extra for a view. 37.78% chose the options because they liked that type of scenery best. 27.78% of participants thought the payment should come from council tax they already pay.

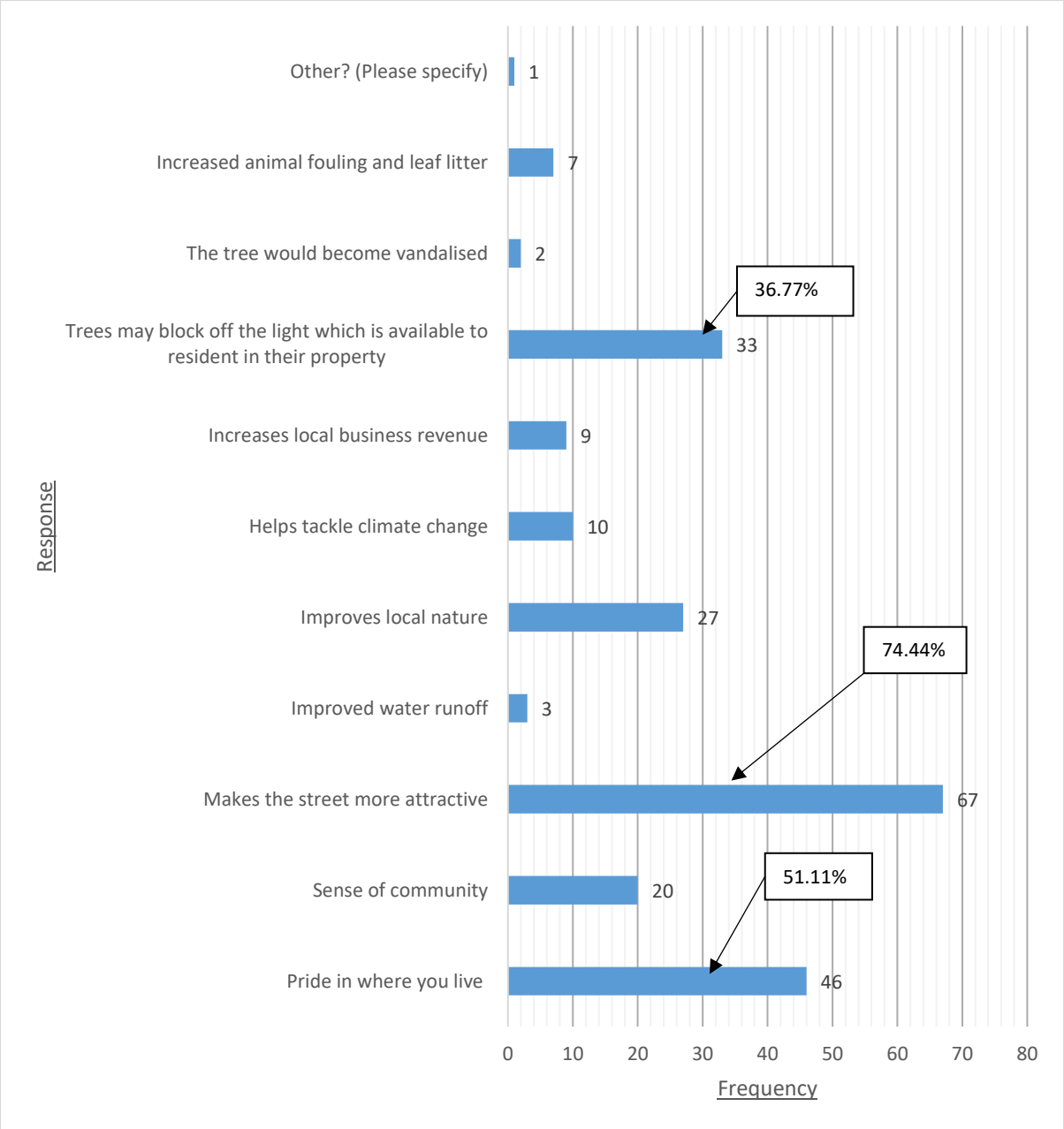

Figure 15: Frequencies and percentages of responses from question 7B – When you were looking at the images, which if any, of the things shown on the card were you thinking about when you were giving your preference? (Multiple-choice answer).

74.44% of participants thought additional greenspace made the streets more attractive, whilst 51.11% said they chose their options as it influenced pride in where they live. However, 36.67% thought trees may block off the light available to their residential property.

5.0 - Discussion

5.1 – Choice experiment (WTP) analysis

5.1.1 – Choice experiment responses

The model derived a significant relationship between cost and all the images. The cost coefficient is negative meaning that as the cost increases the demand for each image goes down. The images coefficients are positive indicating participants prefer the images with additional greenspace to the control with no additional greenspace. The higher the value the stronger the preference to an image in comparison to the control. Image 2, boasting small trees and grass verge, was consistently selected as the preferred image in comparison to the control whilst image 1, with only small trees, was the least desirable view.

The WTP indicated people's preference for the images traded off against the cost and shows how much extra people are willing to pay per month to have each view. Image 2, with the small trees and grass verges achieved the highest WTP average of an additional £12.22 per month for this view. The lowest WTP average was for image 1, which presented the small (cherry) trees and no grass verges, at an additional value of £7.62 with a standard error of ± £0.46. This was only slightly less than the WTP of image 2, which presented the small (cherry) trees and additional grass verges, suggesting that people prefer an image with increased greenery (Mell et al., 2013). Image 3 had an average WTP value of £8.13 and a standard error of ± £0.52. These, in comparison to the average WTP values of images 2 (small trees and grass verges - £12.21) and 4 (large trees and grass verges - £11.36) show a clear preference for the images with additional grass verges.

5.1.2 – Effects of demographics

The relationship that a respondent's level of education, income and age have with regards to preference to the images is displayed by the coefficient (B) (the strength of preference towards each image (see table 2)). Participants that had been educated at university level found the images slightly less appealing in comparison to the coefficients present in table 1, which displays the averages of the overall study. Image 1 is the only value influenced with significance at 10% ($B = -1.41523^* \pm 0.76985$, $p < 0.01$). No other values were significant thus it was found that education has no significant impact on sensitivity to cost ($B = 0.04589^* \pm 0.08475$, $p > 0.01$).

None of the data from the regressions on income or age was significant, thus it is difficult to derive any meaning from this other than to suggest further, more rigorous testing may be more conclusive.

5.1.3 – Comparison with previous WTP studies

Table 3: Results of previous studies of WTP of urban greening modified from Mell et al., 2013.

Location	**WTP Model (Stated/Revealed preference methodology)**	**Investment Type**	**Average Monthly WTP (current prices)**
Yorkshire Dales National Park Willis and Garrod (1992)	CVM (Stated preference)	National Park resources and visitor facilities	£2.19 (residents) £1.6 (visitors)
North Carelia, Finland Tyrväinen and Väänänen (1998)	CVM (Stated preference)	Urban trees/forests	£2.42
New York Peper et al., (2007)	Revealed preference	Urban/street trees	£0.34–0.67
Guangzhou Jim and Chen (2006[2])	CVM (Stated preference)	Urban greenspace and trees	£1.70
London Olympics Atkinson et al., (2008)	CVM (Stated preference)	Olympic games venues, greenspace and infrastructure	London – £1.83 Manchester – £1.00 Glasgow - £0.92
UK Botanical Gardens Garrod et al., (1993)	ITCM (Individual Travel-Cost Method) (Revealed preference)	Access and maintenance of botanical gardens	Edinburgh – £1.29 Sheffield – £1.12 Cambridge – £0.86 Westonbirt – £2.23
Manchester Mell et al., (2013)	CVM	Urban/street trees	Resident £1.88 Business owner £1.26 Work on street £1.71 Commuter £1.76 Other £1.80
Liverpool case study	CVM (CE + post questionnaire analysis)	Urban/street trees in residential area	£7.62- 12.21

The findings of this case study compare favourably with previous WTP studies; however, it is imperative to highlight that the above studies are looking at a variety of ecosystem service types and

targeting different sample groups. In this scenario, we address hypothetical daily beneficiaries, therefore attempted to tailor this study to articulate the opinion of those who live locally to the study site and would therefore have vested interests on the proposed investment.

Mell et al., (2013) used a CVM approach to assess the WTP (also hypothetically paid in monthly instalments via additional council tax) of commuters, residents and business owners for street tree investment in the urban core of Manchester (Whitworth Street, West Manchester). In Mell's CVM, he offers a single code response to signify how much additional council tax a participant would be willing to pay to maintain a specific view. This means that the values obtained are discrete values associated with the cost of maintenance and therefore not directly affixed to any specific attribute. The study displayed a perceived increase in the proportion of green investment (GI) attracts higher WTP values. As the demographic of the participants are not displayed, it means it is not directly comparable. However, it does show that residents (WTP £1.88) valued the additional greenspace more so than any other category of participants (business owners WTP £1.26), justifying our choice to propose additional greenspace to participants in a residential area. Mell et al., (2013) showed that physical characteristics of the GI (I.E greenness) could affect the potential investment of a site, suggesting street trees to be as economically viable as parks in urban areas.

In comparison, this study utilises a CE methodology through the form of a contingent ranking system which asks the respondent to state a preference between one group of characteristics at a given cost in comparison to another group of characteristics at a given cost. This allows the identification of a perceived value change when one or more attribute is added/excluded/substituted, meaning an importance of individual attributes can be derived. This also means that all WTP values are marginal and therefore cannot be directly compared to that of Mell et al., (2013). This study asks participants to consider how much they would pay when the hypothetical scenario is that they are paying for a view on a street in which they live, which could factor in to why the values found here are significantly higher than previous WTP studies. Furthermore, Irwin (2002) noted that a residential view of high-quality GI increases WTP, whilst increased distance from GI has a negative impact on WTP. This would explain why average values given by commuters and/or visitors are lesser than those given by residents (see table 3 above) (Willis and Garrod, 1992; Mell et al., 2013). Tyrväinen and Väänänen (1998) shared this view, that valuation is closely linked with frequency of use. In this study, one can assume that residents would be making use of the proposed GI each day (through the form of visual amenity through views from housing) thus driving up the WTP values to significantly eclipse other studies where investment type differs and frequency of use would be much lower (Garrod et al., 1993; Atkinson et al., 2008; Jim and Chen, 2006[2]). The high proportion of unemployment and retired participants in this study (see section 5.3, appendices 8.7) may also contribute towards to the high WTP values established in this study in relation to other WTP studies. Research by CABE Space (2006) suggested that specific social and ethnic groups, including the retired and unemployed are more likely to make use of green spaces because they are not subject to the same constraints (time or financial) as other people.

The clear preference for the images with additional grass verges correlates with the findings of Mell et al (2013), which was that WTP is directly affected by greenness. However, in contradiction to Mell's findings, the preference in this study, was for the smaller trees as opposed to the larger trees in Mell's study. This is not the first time this has occurred in an academic study. Willis et al., (2003) found that respondents preferred the shape of greenspace to be more 'organic' rather than 'basic' and the scale to be 'small rather than 'large', however it is worth noting that this experiment considered 7 different settings and was catered towards a rural woodland setting as opposed to the urban setting of both this and Mell's study.

Overall, these comparisons highlight that the value of greenspace may differ greatly in different contexts. As Breckfield road has no greenspace at all, the WTP value and importance may increase significantly for residents. This was found too by Cho, Poudyal and Roberts (2008) as empirical evidence from their study shows that amenities of different features of green space vary according to the degree of urbanisation.

5.2 - Justifying your choices

Figure 15 displays quantitative data explaining why the participants made particular decisions in the choice experiment. 56.7% of participants said that it was worth paying more for a view, which seems concordant with other results when considering that 48.9% of participants stated that they would expect to see street trees in a landscape with their ideal view, whilst 65.6% stated they would like a view of a park or public garden (see figure 8). 27.8% of participants believe the additional greenspace should come from council tax that they already pay, whilst 10% said they could not afford to pay any extra. This is understandable as only 52% of participants were in full-time employment (see figure 22) and 42% of households earn less than £30,000 per year before tax lower than the average annual pre-tax income of £33,155 as calculated by Tonkin in 2015 (see figure 24 in appendices section 8.4). Only 4.4% of participants said that it was not worth paying extra for a view.

Figure 16 displays data explaining what participants were thinking of when giving their preference on the images within the choice experiment. 36.7% of participants stated that they thought trees may block off light to the residential properties on the street which would explain why the small trees with grass verges (image 2) were preferred to the large trees with grass verges (image 4). 51.1% of participants stated that pride in where they live was on their mind when choosing the images on the choice experiment. As all of the images coefficients are positive (see table 1) which indicates a preference for the images with additional greenspace with respect to the control, this would insinuate that additional greenspace would give residents more pride in where they live. This is backed up by Jim (2004) who stated that a city with high quality and generous green spaces bestows pride on its citizenry and government. This predominant response, with a 70% selection rate, was that it makes the street more attractive. This is concordant to the positive image coefficients and suggests that additional urban greenspace would improve the visual amenity of Breckfield Road.

5.3 – Personal questions

Through analysis of the survey data displayed in appendices section 8.7 it is clear to see a wide demographic of participants engaged in the study. There is a relatively even spread between male (56%) and female (44%) participants (see figure 16). Despite under 18's being excluded from the study, ages range from under 20 (7%) to 70 or above (4%), whilst participants aged between 20-29 were most abundant in the study, accounting for 32% of all participants (see figure 17). 55% of participants were living in postcodes local to the study site (L3, L4, L5 or L6 (see figure 21)). This suggests that the study provides a good representation of views from people who would be affected by the proposed investment and are likely to know the area well. Out of the 90 participants there is a very wide range of professions with a total of 52 – see section 8.3.

Figure 20 displays diversity within the range of average annual household income for participants, with 20% of participants' households earning over £40,000 a year before tax. 42% of households earn less than £30,000 per year before tax, which is below the average UK income before tax of £33.155 as stated by Tonkin (2015) (See appendices sections 8.4 and 8.7). This contextualises the area of the

study and is a reason why the WTP values associated with the choice experiment were different to the study by Mell et al., (2013).

Despite all participants being over 18 years of age, only 52% stated they were in full time employment, which is well below the 76% stated on the Office for National Statistics (ONS 2019) website from March to May 2019 (see figures 24 and 25 in the appendices respectively). Only 58.9% of participants (67.1% if excluding retired participants) were in any form of work, which was significantly less than the 75.4% of people aged from 16 to 64 years stated by the ONS for December 2017 to February 2018 (ONS 2018). 12.2% of participants stated that they had retired and 6.7% worked part-time. The fact that the study was conducted in the day when many people would be at work could influence these results and also increase the overall WTP values (CABE Space, 2006).

There is a wide range in education level within the participants (see figure 19), with the majority (35%) reaching secondary level education, 18% undergraduate level and a further 30% being graduates. It is also worth noting that there is variety between residents who own and rent their homes, with 47% of participants owning their own home, 9% of people renting from the council and 33% of people renting private accommodation (see figure 23).

5.4 - Participants values

When asking the participants a multiple-choice question (they could select up to 5 answers) on what they valued most in making a good place to live, health services was deemed most important and was selected a total of 49 times which equated to 54.4% of the participants viewing this as in their top 5 most important factors out of the options offered (see figure 7). Clean streets were the second most popular answer with 47 participants (52.2%), showing that the appearance of a street is important to participants within the study. This is unsurprising, as clean streets are well known to increase both a sense of security and pride within an area (Appleyard, 1980). However only 25.5% of participants noted access to nature as one of their top 5 values and 18.9% of participants stated that street trees were of importance (see figure 7). This contrasts with responses from the following question; 'Which of the following features would you expect to see in a landscape with your ideal view?' 48.9% of participants stated that they would expect to see street trees in a landscape with their ideal view, whilst 65.6% stated they would like a view of a park or public garden (see figure 8). This disparity between what participants would like to see from their property and what they deem to be most important in making a good place to live suggests that they value greenspace as a nicety but not a necessity. This contradicts what a plethora of research states; that urban greenspace is more than a luxury and can have restorative effects on mental and physical wellbeing (Appleyard, 1980; Ulrich, 1984; Tzoulas et al., 2007; Van den Berg et al., 2010; Thompson, 2011; Gladwell et al., 2012; Thompson et al., 2012; Villeneuve et al., 2012; Keniger et al., 2013; Kardan et al., 2015) highlighting a potential need to educate the public about ecosystem services and the impacts urban greenspace can have on human well-being. Improved education on the matter may well inform decision-making and lead on to influence policies to create greener and healthier cities (Maas et al., 2006; Gómez-Baggethun et al., 2013; Crouse et al., 2017).

The ideal views of residents also contrast greatly with the current views from their properties, with 74.4% of people currently viewing residential properties from their homes (see figure 9) and only 18.9% stating this would be in their ideal view (figure 8). Similarly, despite 48.9% of people stating that street trees would be in a landscape with their ideal view and 58.9% a grassed area (see figure 8), only 30% could see street trees from their current view, and 31.1% a grassed area (see figure 9). This highlights the demand for additional urban greenspace investment within the study area of Everton

and displays a potential opportunity for investment to improve the area by offering residents a view that includes features that the majority would like to see.

5.5 – Greenspace Usage

As displayed in section 4.2, only 12.2% of participants visited local greenspace daily (see figure 10) despite a high proportion stating various forms would be in a landscape with their ideal view (see figure 8). This is fewer than the 25.5% who stated that access to nature would be one of their 5 options in what makes a good place to live, thus one can conclude incorporating greenspace in the form of street trees on residential streets may be beneficial in allowing more people to visit greenspace and benefit from the cultural services of greenspace (Groenewegen et al., 2006). Most participants (77.8%) tend to visit greenspace with family and friends (see figure 11) which would support Zhou and Parves-Rana's (2011) hypothesis that urban greenspace can provide many social benefits including enhancing social ties as well as aesthetic enjoyments. 2.2% of participants stated that they never make recreational visits to a greenspace outside of their local area, whilst 30% said that they make a trip every three or four months (see figure 12). 38% of participants make a recreational visit to non-local greenspace monthly. The 36.7% of those without a garden (see figure 13) may account for this high percentage of family and friends visiting greenspace together (77.8%, see figure 11). It is possible that when they do so, they venture outside of their local area to an area of higher biodiversity, which is declared by Willis et al (2003) as being the second highest social and environmental benefit of forests in Great Britain valued at an economic value of £380,000,000 (approximation on data retrieved in 2002).

6.0 - Conclusion

The visual amenity of green investment in urban areas is notable. Previous WTP projects have highlighted positive public responses to proposed investment in GI, which is further validated in this study through the clear preference for images with additional greenspace in comparison to the control image with none. It is clear that greener residential streets are viewed more favourably than those with low levels of GI. Though residents are WTP for additional GI, as the costs associated with each image increased, the demand for each image reduced. This indicates the importance that the public associates with street trees may trade-off with their own limitations of affordability. There is certainly an opportunity for local councils to reduce the disparity between what features residents wish to see in their ideal view, and what features are currently visible from their residences. Despite the most popular response for a park or public garden to be in a residents ideal view, street trees seemingly offer an affordable compromise to improve visual amenity. If partnered with grass verges this would then offer the second most popular feature in a view to residents and the most popular WTP option, without demanding the need for dramatic land-use change. The data displays that WTP correlates with increased greenness however; the physical size of the green space is not always the determining factor behind people's WTP. Street tree investments should therefore be considered as economically viable, in terms of investment options, as larger public parks, especially in deprived areas that have the most to gain from urban greening. If additional analysis is applied to account for the plethora of additional ecosystem services (excluded in this study) street trees and grass verges would offer residents, it would be possible to trade-off the proposed cost of investment to the perceived benefits offered to residents, not discounting improvements in health, well-being, additional recreation spaces and tackling climate change as benefits of GI.

Chapter 2 - Assessing Perceptions of Key Stakeholders in the Liverpool City Region to the Natural Capital Approach

1.0 - Abstract

In recent times, the field of economics has been explored with the aim of finding a tool capable of framing environmental challenges. The government has proposed the 'all-encompassing' natural capital approach in their 25-year environment plan, as a potential solution, focusing on the quality and quantity of stocks of natural capital as well as the flows of benefits. The unique abundance of natural resources present in the North West, partnered with the nationally renowned environmental leadership and knowledge found within the LCR offers a suitable testbed for such an approach. This study applies thematic analysis on semi-structured interviews to assess the perceptions of key stakeholders within the Liverpool City Region to the natural capital approach. Outcomes display perceptions of the natural capital approach within the LCR vary across the stakeholders interviewed, dependent on metadata, such as sector and/or knowledge of the approach. The ethics of the approach and the semantics surrounding it are contentious topics; however, the majority of stakeholders saw positives in using the approach as an accessible communication tool, specifically for involvement with business. Perceived strengths of the approach include its ability to engage the private sector and potentially leverage private funding in contribution to GI developments. At current, a perceived lack of incentive for the implementation of a natural capital approach across both public and private sectors may act as the most significant barrier to implementation.

2.0 - Introduction

Natural capital is defined as the natural assets including ecosystems, species, freshwater, land, minerals, the air and oceans, that when combined with other forms of capital (i.e. human capital) can produce a set of services and goods that underpin our economy and improve our wellbeing (Natural Capital Committee, 2016). We refer to these benefits that come from natural capital as Ecosystem Goods or Services. It is essential to understand that natural capital's fabric is nature and that is of course much more than a capital asset, however thinking about nature as a capital asset has some added benefits in certain contexts. Until recently, most applied environmental economics work was highlighting the fact that the environment has value that surpasses the price some goods fetched in markets (Schumacher, 1973; Özdemiroğlu, E., 2019). In the last decade or so, there has been increasing pressure for businesses to invest in environmental improvement, through both corporate social responsibility (CSR) and the increase in legislative incentives. Payments for ecosystem services, biodiversity offsets, no net loss and more recently net gain principles are becoming increasingly apparent in the corporate world. Partnered with an increase in demand for transparency in operations regarding businesses attitudes towards climate change and biodiversity loss, there is now an expectation for businesses to make a positive contribution to society and nature (Desjardins, 2017; Smart, 2019, Özdemiroğlu, E, 2019). This creates a forceful driver for businesses to reduce their environmental impact as a tool to stay current and present in the market place and offers an opportunity for a comprehensive, all-encompasing approach to facilitate systems-based thinking if integrated into policies and management decisions.

The natural capital approach focuses on the quality and quantity of stocks of natural capital as well as the flows of benefits. This differs from the ecosystem services and cost-benefit analysis approaches which focus solely on the flow of benefits, as such they are inputs to a natural capital approach (eftec,

2019). Focus on the quantity and quality of stock allows for recognition of scarcity and therefore provides an insight as to the time-line of resources and how decisions made today may influence the future. This should help include cumulative impacts of independent decisions over time and space as it considers both the impacts and dependencies of an economic activity on natural capital over time, incentivising companies to think long-term in their approaches. This means that 'quick wins' on behalf of CSR are more likely to be exposed and an emphasis should be placed on embedding conservation values into long-term planning and developments.

It is important to be aware of the limitations of economics. It is only one approach to framing environmental challenges and its role should be to support, not make decisions (Özdemiroğlu, E., 2019). An economic approach may always struggle to account for certain values, such as the intrinsic value of nature as mentioned by O'Neill (1992); Vilkka (1997) and Costanza et al., (1997). There is however, increasing interest in the use of economic valuation of ecosystem services and goods for a wide variety of purposes including supporting decisions about the allocation of scarce resources from research providers, policy-makers and private sector decision makers alike (Tinch et al., 2019). In research conducted to assess business attitudes towards funding ecosystem services provided by urban forests (Davies et al., 2018), it was concluded that businesses supported the idea of private sector investments in urban forests. With large and prominent businesses such as Nestle, Thames Water and ASDA forming a global network of companies**,** titled the Natural Capital Impact Group, working collaboratively, to determine how business can sustain the natural world and its resources through its strategies and operating practices and publishing documents for all to see, this arguably signifies a shift in mentality in the corporate world (Cranston et al., 2015). It seems as if natural capital is a concept that businesses will 'buy' into.

The UK government has also made bold statements of intent concerning the natural environment. Back in 2011, they issued a white paper via DEFRA (Department for Environment and Rural Affairs) publicising their target to 'leave the environment in a better condition than which was previously inherited' (DEFRA, 2011). Since then, a 25-Year plan for the Environment has been released, aiming to direct the UK on tackling major issues currently facing out natural world (UK Gov, 2018). It highlights that economic growth and the natural environment are not mutually exclusive, in fact mutually compatible and that sustainable economic growth relies on services provided by the natural environment (natural capital). The plan is underpinned by the natural capital approach, providing a means of identifying and quantifying natural resources and associated ecosystem goods and services that can help integrate ecosystem-oriented management with economic decision-making and development.

As suggested by Bowe (2019), the natural capital approach can be set out in three objectives:

1) To create a baseline for the condition of the natural capital, set clear natural capital targets and monitor change (based on natural capital accounts).

2) Use this information on natural capital to influence decision makers to make informed decisions.

3) To underpin the decision-making process by developing innovative funding mechanism so payments are made by those benefiting from natural capital to restore and maintain it.

Embedding the natural capital approach into policy interventions linked to economic development at a local level (i.e. spatial planning frameworks, introducing a net gain environment policy, creating local natural capital investment plans) is key to maintaining the environment while driving growth. Such approaches will aim to achieve economic growth that considers local needs and values whilst

remaining resilient due to being underpinned by the benefits of well managed/maintained natural capital (Bowe, 2019). However, these approaches are still in their infancy and must face further testing.

Liverpool City Region/Combined Authority is an area rich in natural assets. It has a coastline and estuary protected under both the birds and habitat directive and RAMSAR due to its internationally high nature importance, alongside hundreds of other areas of high biodiversity value. Urban GreenUp's diagnosis report (based on typology mapping produced by the Mersey Forest) states that GI coverage across the Liverpool City Region accounts for 62% of total land cover (Urban GreenUp, 2017) whilst prior reports claim as much as 80% of the LCR is green/blue space, more than any other UK city (Nature Connected, 2015). The Metro Mayor has high ambitions to be zero carbon by 2040 and the greenest UK City Region (Nature Connected, 2017). The unique natural assets of the Liverpool City Region and its opportunities for growth (i.e. a natural coastline and estuary of international conservation importance alongside large-scale wind generation, high potential for tidal energy and major development projects such a Wirral Waters and Liverpool2) make Liverpool a unique and interesting testbed for the natural capital approach. These natural assets, nationally renowned environmental leadership, and knowledge (i.e. The Mersey Forest; Merseyside Environmental Advisory Service; Lancashire Wildlife Trust) means the city region can provide a significant contribution to the national debate on implementation of the 25-year plan (Bowe, 2019). However, perceptions of the environment being a risk of limitation to development, lack of knowledge on dependences on NC, lack of incentives for uptake of natural capital approach, limited knowledge and confidence in ecosystem services valuation may be acting as barriers to the implementation of natural capital to the Liverpool City Region.

In order to assist in the implementation of a natural capital approach in the Liverpool City Region it is important to gain an understanding of the current views of the concepts of natural capital by key stakeholders with the city (Bowe, 2019). It is also key to identify perceived advantages/disadvantages to such an approach and barriers to implementation by key stakeholders. Through thematic analysis of semi-structured interviews, this paper aims to analyse the perceptions of key-stakeholders within the Liverpool City Region to the natural capital approach.

3.0 - Methodology

A stakeholder mapping exercise was conducted to identify organisations and individuals that are representative of key sectors within the Liverpool City Region, both public and private including housing, energy, logistics, policy and more. As the Government approved Local Nature Partnership (LNP), Nature Connected assisted in this process. Participants were identified through Dr Colm Bowe's network across the Liverpool City Region. Dr Colm Bowe sits on the Nature Connected Board and the Biodiversity and Environment Research Board of the Mersey Gateway Environmental Trust. Nature Connected provided contact details for participants, who were initially contacted via email to establish their interest in partaking. All organisations vary from dependent to heavily dependent on the Natural Environment. See table 1 below for the range of stakeholder types involved in the study.

Stakeholder Type	**Quantity of Separate Organisations Involved**
Business (Water Company)	1
Business (Developer)	1
Conservation Organisation	1
Environmental Charity	3
Local Government	4
Government Agency (Environmental)	2
Higher Education	1

Table 1: Range and quantity of respective stakeholders involved in the study.

Semi-structured interviews were conducted, face-to face (n=13) with directors, managers, environmental advisors and more. Participant roles included specialist officers, including catchment officers and those within sustainability roles at management and director level.

Semi-structured interviews involve a set of open-ended questions that allow for spontaneous and in-depth responses (Ryan et al., 2009), thus were deemed appropriate in eliciting key stakeholders within the Liverpool City Regions' views on natural capital, the natural capital approach and the opportunities and barriers to its use in the Liverpool City Region; more specifically within their sector. A loose interview guide was developed prior to conducting the interviews, whilst interviewees were not made aware of any questions in advance and knew only that the topic explored would surround natural capital. Using a thematic analysis framework (see appendices section 8.6), relevant data from these conversations was elicited and grouped into six main themes:

- Dependencies on Natural Environment
- Knowledge of ecosystem services and the natural capital approach
- Knowledge/Opinions on existing policy/future policy changes
- Investment in Natural Capital/Net Gain
- Barriers/Opportunities within the LCR
- Strengths/Weaknesses of Approach

Qualitative data is particularly appropriate for studies ascertaining people's attitudes (Davies et al., 2018). During the interview, follow-up questions were therefore employed, giving the respondents an opportunity to elaborate on their answers – particularly if a point of particular relevance to the study was raised (Foddy, 1994). The interviews lasted for 43 minutes on average, ranging from 29-62 minutes. They were recorded with a Dictaphone and then transcribed verbatim (edited to remove repetitions, stop words and habitual irrelevant phrases) with additional help from the online transcription software, Trint. NVivo v.12 was used to analyse the transcripts using a thematic

approach, identifying key topics and highlighting common themes and trends. Findings are presented in the results section as numbers of respondents commenting on a theme and the numbers of comments they made. Direct quotations were also selected to illustrate the key points, as suggested by Braun and Clarke (2006). Stakeholders are identified as ST01 to ST13.

4.0 - Results

4.1 - Knowledge base in the Liverpool city region

4.1.1 - Dependencies on Natural Environment

All 13 stakeholders stated they have strong dependencies on the natural environment. On a whole, these organisations were thoroughly engaged with work surrounding the natural environment. This is to be expected of the environmental charities and environmental government agencies that participated in this study, as their work is primarily based around stewardship of natural resources and therefore they are entirely dependent on the existence of the natural environment. In this case, the businesses interviewed are also heavily dependent on the natural environment as they have a strong focus on land-use, offering provisioning services as a product to the public.

ST03 – "So it is a conservation organization. So, it's ultimately about the natural environment."

ST05 – "It's relevant both in terms of direct benefits that people get from the natural environment. So, the fact that we've got lots of lovely parks and green spaces that people can go out there they can take a bike, take their kids you know there's health and well-being benefits of that there's sort of just like mental health benefits of that. Just another side of that I think is that the place marketing side of it. think we were quite acutely aware that that is a really strong part of our identity and particularly you know visitor economy stuff it's pretty big."

ST10 – "So we provide safe drinking water to over 7 million customers across the northwest. And we start we takeaway sewage water and discharge back into the environment through this regulation. So that's what we do. We're also a major landowner in the Northwest. We own over fifty-five thousand hectares of land. So obviously catchment management's important to us as well."

4.1.2 - Knowledge of ecosystem services and Natural Capital concepts

All 13 stakeholders displayed some awareness of ecosystem services as a concept. Not all participants understood exactly by which metric they are measured, with some stating that in order for a natural capital approach to be rolled out nationally, more information would need to be made available. Other participants, perhaps with a greater understanding of the metrics behind ecosystem service valuation highlighted the benefits of taking that approach.

The range of stakeholder knowledge of the natural capital approach varies greatly. All stakeholders had some knowledge of the approach, with 12/13 (92%) seemingly understanding the approach enough to feel comfortable explaining their interpretation of its concept and the potential implications of its application within their sector. Length and depth of explanations also vary significantly, with most stakeholders giving their personal stance as opposed to speaking on behalf of their organisation.

ST08 – "I think ecosystem services, I don't fully understand how those things are measured at the moment. I know it's quite tricky to measure. So, I think there would need to be an understanding as to how you have information and monitor that in some way."

ST07 – "My personal view is there is real benefit in looking through the ecosystem service lens because then you can start to value the services that our natural environment actually provides to, to humanity."

ST05 – "So I understand it's kind of linked in to or perhaps the ideas taken from or borrowed from social capital in terms of your trying to value the natural environment but in a way that makes sense in terms of the way our current economic approach to the world works. So that could be things like pollination even of crops or it could be as I've said if you've got like a nice park next to a river if it's sort of you know, it's that flood water sort of holding and stuff like that. So, it's kind of trying to I guess quantify in a more precise method what those benefits are and how can we maximise them? Because I suppose if you're kind of aware of what are the benefits that the natural environment provides you can then design around that and I suppose it's kind of trying to ascribe value to it so that people understand the value of what these things are."

ST03 – "I can't say I know a great deal about the natural capital approach. But what's my take on it is that everything has a value and that we don't have such a financial value on the natural environment and that it would be helpful in economic terms and giving a value to what we need to maintain for the future and why we need to maintain it gives it a monetary value."

ST06 - "So the natural capital is all those natural assets that are around us that make up the environment around us. They might be habitats they might be the resources in the environment around us, so our soils, geology, rivers etc… So that's an asset. That stock of all of the natural environment out there. But that's obviously got a value aesthetically in itself a lot people would say, and I think so, but it's also got a value to us a society in terms of goods and services that natural asset is providing for us. So that might be around food provision might be about regulating the environment be it about floods climate air quality etcetera. There might be a benefit for to us from a health perspective etc… In terms of bio medicine but also talked about health also the natural environment providing a nice place for people to go and undertake activities and contributing to their physical and mental health and wellbeing."

ST08 – "So with the natural capital likes, the way I suppose I see it is that identifying natural assets, priority assets within the area and building them into a strategic framework so that they can be monitored in some way or protected and safeguarded."

ST12 – "So I've never implemented a Natural capital approach. It might impact on a whole range of other aspects where we are we are paid to provide services and actually how we use natural assets in our portfolio to support those costs as well and possibly offset some of them."

4.2 - Policy and Governance

4.2.1 - Knowledge/Opinions on existing policy/future policy changes - 25-year environment plan

All participants mentioned the 25-year environment plan, though knowledge of the document varied significantly. The immediate importance of the document contrasted between stakeholders, however the vast majority mentioned implications for the future. A general theme emerged, in that some stakeholders were awaiting further confirmation of direction from the government in the way of legislation before taking any particular stance. Government workers seemed more tentative to commit to any such direction, as opposed to the businesses and charity workers who were already using the 25-year plan in reference as a framework for future developments.

ST13 – 'With running the catchment-based approach in two counties, and the DEFRA 25-year plan is the benchmark and starting point for everything that I do with my consortia."

ST08 – "I'm not as aware of it is I should be I know about it. There's a lot of discussions about it but I don't know the ins and outs. I don't think some of it is finalised. But it will most certainly have a massive impact on what we do because so much of it is led by legislation."

ST07 – "Too early to say. And the reason I say that is we don't know which way the government's going to go in some of these things. We've heard some mood music that things such as net gain might be embedded within the development process and the planning process. Whether that will actually take place has yet to be proven."

ST05 – "So the 25-year involvement plan is really interesting, and I think it's kind of it's got some pretty interesting commitments in there about the environment. The thing that we've been focussing most on has been the resources and waste strategy which is linked into the 25-year involvement plan particularly around single use plastics."

ST05 – "So in terms of the broader 25-year environment plan it's so sort of... It reads like a lot of government documents which is, it's all really good stuff but it's kind of it's so high level. You kind of think well where do you kind of go from there with some of it. Because it's ultimately, it's a vision piece. It's not an action plan."

ST10 – "And that works really well with where the kind of the latest trend in policymaking and regulation is coming from particularly with the publication of the 25 years on where DEFRA kind of sets the direction. And the water industry so the plan that the environmental agencies put together for the water industry which sets out a direction in terms of saying we want to we want to see more natural capital investment plan."

4.2.2 - Knowledge/Opinions on existing policy/future policy changes - Environment Bill/ELMS

3 stakeholders highlighted the need for a gatekeeper for the environment, however respondents were relatively unfamiliar with plans regarding the environment bill and 2/3 were sceptical of its execution. One respondent was particularly keen on the proposed ELM system (Environmental Land Management System), whilst all those who commented on the environmental bill highlighted a need for an independent commissioning body with an incentive to oversee the commissioning of services.

ST10 – "Who's running the show who's commissioning the services is the problem. It should be an independent commissioning body; the system operator needs to sit outside of the system to be able to kind of commission the right services and to stimulate the right supply and demand. Such a thing doesn't exist. Should it be via Environment Agency? Potentially. Does he have to be from a public sector? Absolutely, because the government comes from that sector. And the government needs to set that direction, but it can't be political because then you're changing depending on the partisan ruling."

ST10 – "We want to see more environmental stewardship rather than just delivering your regulatory requirements in isolation and in silos."

ST07 – "I know it's sort of kicking around and I've seen sort of some of that discussion about some form of national environmental regulator to oversee because we will have left the European Union in

disgust. And someone to actually be a proper sort of gamekeeper and arbiter in this because planning inspectorate isn't doing it."

ST03 – "Well I think it should be the government at all levels. But the want has to be there doesn't it and that has to be done properly and with a will behind. I think in terms of fundamentals we don't have a police wildlife liaison officer and we haven't had for years. You know it's just like those small little things that would make a huge difference just doesn't exist yet."

ST03 – "Yeah again kind of think there's huge opportunities because while if some ecosystems then you're not trying to prove that you are farming in creating a product. So well again you could say that farmers will lose out, but should they be farming and making their own profits anyway. And should they be looking at ecosystem services within their land holding should not be of higher importance anyway. So, if that means a change from farming production of rural environment if you like in a habitat-based kind of way then again it's a good thing from a wildlife trust point of view not necessarily for the farming economy."

4.3 - Investment in Natural Capital

4.3.1 - Investment in Net Gain

All 13 respondents had plenty to say about net gain. The majority of comments were positive; however, one respondent was openly sceptical towards the idea of it becoming mandatory. In general, the concept was well received however comments were made surrounding improving the metric prior to rolling out mandatory net gain, including a suggestion to include social value into the approach. Lines of communication have been established between 2 stakeholders and DEFRA with regards to testing the net gain concept through case studies. Comments were made about the approach perhaps being over-ambitious with developers claiming DEFRA need to move the goalposts in order to set realistic targets. Criticism of the approach was also made with 1 stakeholder cautious developers might use net gain as a tick box to get planning permission. On a whole, the concept sat well with the stakeholders and 10 respondents made positive comments, with some stating they are already in a position to roll out the approach.

ST04 – "I think a lot of people still quite in shock in a nice way about that because you know that's quite a coup really for the environment you know. To look at that and I think that's nature-based solutions obviously are a really good opportunity so in terms of the net gain once we've quantified how beneficial something like a green wall is suddenly we'll have all these opportunities of how we can use them to deliver net gain."

ST09 – "But we will have a role just because we have got the access to the natural resources. And we know how to achieve a net gain, be that biodiversity gain or general more environmental gain."

ST05 – "Yeah, I think I'm aware there was some stuff out in the Spring Statement around single use plastic and some other bits but honestly I've got say as of yet we've not pivoted anything around that net gain. I know they're talking about it in the 25-year environment plan though and get the idea that as I said earlier that we should be investing and not just sort of holding to get, seeking to get... To maximize the benefits, I suppose you'd say."

ST11 – "I think it's really positive because we've opened a positive line of communication with it directly to DEFRA and Natural England on net gain, so that's great. We're producing case studies which we presented to them. And I suppose that feels a little bit one way at the moment. We can suggest things we for example said that the DEFRA 2.0 metric doesn't work. We don't have any

particular signs that they're changing it because of what we're saying. Although I believe that other developers are saying the same thing and saying it's particularly difficult to get a net gain on a residential site. That for me comes back to principles really in terms of setting a target that you can't meet. I don't think it's right that they should set the target that you can't meet. I think you should set a target that you stretch for and if you put some effort into it you can meet it but our case studies show that all the effort you possibly can and you still can't meet net gain. And I don't fundamentally think that's right as a principle. And also, a hard sell to the private sector in terms of, I think the private sector needs to be able to show that it can make it can meet its targets. So why would we set a target that we can't meet. Which is a slightly different angle I think from say the local authority angle. Which is that they like to set a stretching target because if they get anywhere near it then they maybe get more than they hoped."

ST11 – "I have been asked to speak at national events. Talking directly with DEFRA net gain advisors. They've come up to Manchester and we had roundtables Manchester focused businesses, property developers. We're going to be going to be going down to a roundtable with Michael Gove's special advisor to talk about that, in June. So, you know a roundtable with the new chief executive of Natural England. So, I think that's great. That's an opportunity. With the greater Manchester combined authority, we've imputed through the net gain task scores. So, their guidance, which we're hoping will be largely adopted nationally. So that would be a great benefit if we've been able to feed into that. And actually, then that's what we've planned for and then that becomes adopted, Nationally. That would be a great business benefit."

ST02 – "Well we have worked with DEFRA on their net gain proposals. And if you want to you can see our consultation response on their net gain. Because the net gain talks about natural capital it doesn't talk about social value. Our view would be that it should do. And that actually if the mitigation is being designed in the most appropriate way then not only will it get biological net gain, but you'll get a social value being created at the same time. That takes a little bit more thought but for the same amount of cash being spent on that site you could get both."

ST03 – "So again we've looked at it from a positive as to is this really going to be a net gain because you can say it's a net gain and it potentially isn't. So again, a bit like the government and it's maybe just that we are a bit sceptical. It sounds good, but the reality is it true and certainly it hasn't happened yet. Yeah because I'm putting in objections to all kinds of planning applications. And we have a line that says net gain. And then all these papers. But nobody is making any legwork to offer it. And even when you point out that this net gain all the consultants or members employed saying well it is on this site what those losses. So how can it be. So again, there needs to be some work on the maps if you like. And that's only that it is true Net gain rather than what somebody pays to think is net gain."

ST02 - "You know if you look at net gain then there will be developers that needs or that want to develop a site and they need to mitigate something in an offsite situation and so are willing to put some money towards that. And it's just a clear transparent way of being able to do that."

ST11 – "So making sure that, yes absolutely let's do biodiversity net gain but let's make sure the metric is right. So that and we send out the right messages to people. So, at the moment the biodiversity net gain metric doesn't favour tree planting. I think is a really dangerous message to send out to developers. Maybe there's a little bit of naiveté in there. People will plant trees anyway. Well at one end of the development scale people will and the place makers amongst will. But at the other end which is more, you know, the less responsible end people will use as a tick box size to get planning permission. And I suppose the most dangerous area in that is where they feel they can offer.

They can. Do it on the site they can achieve net gain on site. But maybe that doesn't involve trees. If they're just totally straight to off-setting, then the issue is managed by somebody else it's managed responsibly. But if people think oh yeah we can do this onsite then we can do a tick box exercise on site and I think especially in an urban environment if it's about the right number of biodiversity units it could be a very dangerous message and for the future then it could be like a 180 degree turn in terms of, 'Alright we asked you to do so but now we're changing it'. And that's a really difficult situation develops as well."

4.3.2 - Investment in the Natural Capital Approach

9/13 participants spoke about the potential for investment in the natural capital approach. The vast majority deemed it viable for businesses to invest, mainly due to CSR benefits. 1 stakeholder mentioned the potential for innovative funding mechanisms to drive investment into net gain/natural capital approaches. Overall, respondents looked at the majority of this investment happening in the future, with 1 interviewee highlighting the potential significance of such investment further down the line.

ST13 – "The developers naturally have to invest in corporate social responsibility, net gain and pay back. And then I'm sure that the organizations and the communities that work next to those developers make full use of those opportunities."

ST02 – "Yeah because you have organizations that have got natural capital deficit that will want to mitigate for CSR benefits. There's a little bit of money changing hands on that but insignificant in the big scheme of things. Where we'll be in 25 years, anyone's guess really but it could be really potentially quite significant. You know there's a lot potential there. Yeah but it just depends on the implementation and then take of it. It's got to work commercially as well as environmentally and that's quite a hard balance to strike."

ST01 – "Yes there always has been that space for putting an economic value on green space and planning."

ST06 – "But I think there were there are probably a range of types of issues that could be helped by strategic approaches to investment and that might be one-way developers can demonstrate net gain. So, they might not be able to do something on that particular development site, but you might be able to make a financial contribution from your own development to a wider fund that can actually deliver something more strategically. So, a combination of resources to deliver something bigger and better than lots of piecemeal stuff on individual development. I think we will see more of that sort of approach into the future."

4.3.3 - Knowledge/Opinions on existing policy/future policy changes - Section 106 (Developer contributions)

Section 106 (Developer contributions) was mentioned by 6/13 stakeholders. The general view on section 106 seems to be positive. Those that work with developer contributions speak positively of their application and impact, with some respondents offering insight as to how they aim to secure future funding for green space through the policy. A suggestion that section 106 may be used as an incubator, to facilitate large GI opportunities was also offered via one stakeholder.

ST04 – "So what you would effectively do is your mark out where you want your corridors to go and then the land it crosses you effectively flag. So when a planning application comes in if it falls into or adjacent to a piece of land that's flagged as this is a future corridor route straight away it triggers 106

coming in for this development goes into the corridor it goes into producing so many meters of kilometres a corridor or it split in half goes to the corridor and half goes to any play facility or whatever other kind of intervention we might need."

ST01 - "Section 106 is going down into well at the moment. We've just taken on a new coordinator because that is one thing that we are going to try get more strategic about. But there is scope to take slices off 106 it's very legally defined you've got to be very careful with it."

ST13 – "We work an awful lot with developers with section 106 and historically have done. So yes, we're very familiar with it, it is applied an awful lot and it has been applied for many years."

ST13 – "I would like to see how Section 106 can be treated rather more as match much larger aspirational opportunities. You might go to the Arts Council heritage or heritage lottery refund to do sculpture trails and what else. And then you pull that together with your section 106 and suddenly you've got a huge great big green infrastructure opportunity. So, I would like to see section 106 used a lot more as incubator so it's just not to stand alone."

4.4 - Implementation of the natural capital approach within the LCR

4.4.1 - Opportunities

All 13 stakeholder listed opportunities within in the LCR. Most comments hinged around the unique abundance of natural resources present in the North West and the responsibility to maintain them. One particular comment highlighted that in at least one scenario, information of land use/land cover was already available alongside knowledge of stakeholder relations in that area, indicating they are advanced in preparations to explore implementing a natural capital approach. Other comments emphasized the opportunities for large development projects in Liverpool to adopt the natural capital approach and how that then could feed into the overall well-being of the city in social, environmental and economic terms.

ST13 – "I think because of all of the development that's happened since Capital of Culture, since the Atlantic Gateway, Peel Holdings etcetera and so forth. We have such a huge opportunity to become what Liverpool was. And I think we're halfway to getting there. But if we can get the green infrastructure in the Blue Economy, a circular economy model right, it becomes a tourist attraction, it becomes a better place to work, it becomes a better place to visit. The cruises are stopping off and I think if you can look at a happy, safe, sustainable, resilient environment you also start hitting all the buttons for some increased growth on all accounts and levels. And in terms of resilience, flood resilience, increasing biodiversity, you make for happier homes, happier healthier lives."

ST09 – "Well we already know we know what land cover we have. We could easily put percentages on different landforms. How much salt marsh we've got, how much other land we've got and so on. So, we know that, we have a good understanding of the ecosystem services. We've got a good understanding of the stakeholder relations in the estuary. So, I think we've got quite a good starting point for natural capital approach really. But yeah, to have this idea of like to bring net gain to the estuary. Because that is a reoccurring thing in whatever we do, every project we do. If it's putting cattle on the sort of salt marsh for wildlife benefits, there's always this ' Oh there is a net gain that makes it better than it was before'. It's just in our daily work, it's just always present I think. To conceptualise that I guess hasn't happened as such, but I think that the base knowledge is there. So, I suppose we could write it up as a natural capital approach."

ST04 – "So I think in terms of the spatial stuff for me, Liverpool's quite lucky compared to a lot of cities. We do have areas of green space and areas of ground space, so we can still form these corridors, or we still do have land."

ST04 – "You know Liverpool might lead the way because we were lucky enough to get the funding and we'll trial it and test it and hopefully if it's successful other neighbouring authorities will see the benefits. As we extend our corridors that they'll do something similar maybe to join us."

ST06 – "I think we will see more of those and I think as we get bigger development projects along the coast those are going to need to either through regulatory terms like habitat regulations they're going to need to mitigate or compensate so try and find alternative habitats for losses they might be causing. So, I think we'll see more of those sort of projects or other types of projects but things that mitigate or compensate for losses. But on top of that I think when net gain coming along we'll see added value out of those projects and then do more than the minimum they need to do."

ST07 – "So I think what makes Liverpool city region quite unusual compared to quite a number of other city regions in that we are virtually surrounded by internationally important nature conservation sites, so the Natura2000 sites, European sites. We are blessed with an amazing wealth and diversity of those sites. At the same time trying to have that coexisting with, really coexisting with economic and social aspirations. The obvious example being the Port of Liverpool on the Mersey Estuary. A very heavily designated area for nature conservation but also parts of the beating heart of the economy of our area, the North West England, the national."

4.4.2 - Barriers

Perceived barriers to the implementation of the natural capital approach within LCR were noted by all 13 stakeholders. Embedding the approach into existing frameworks, for both local government and businesses alike was frequently mentioned as a problem area. Balancing economic and social aspirations with a new approach on development was also highlighted as a potential difficulty, specifically in relation to the Port of Liverpool (a key component of the economy in the North West) within the greater Mersey Estuary (an area heavily designated for natural conservation). Further standalone comments were made concerning doubts about Mersey Forest's management approach not being tailored to fit with the current scenario, highlighting greater issues for all stakeholders in the North West to find mutual ground in implementing an approach that works for all. Deploying such an approach at an appropriate time was also stated as being significant in the uptake of implementation. One comment stated that as Liverpool has not been selected for involvement in DEFRA's Urban Pioneer programme, it may not have the investment, tools or support that the neighbouring city of Manchester has to implement a natural capital approach.

ST01 – "There is an area where I do disagree with certain environmental partnerships because I think it comes back down to that management approach. The formulas are all about putting trees in and therefore green space and therefore you get a benefit. I think that's too simplistic because I think over the years I could put 10 trees over there. If that space is ready to change if there's an economic something happening, if a movement they can influence that you can make it better. But if I go put 10 trees now over in the back end of Birkenhead It won't make any difference because the bigger patterns are changing. I don't think the tree itself is doing it I think it's hitting it at the right time in the cycle. So, you can't actually prove the tree itself."

ST09 – "So what's missing is that the actual baseline, the actual to phrase it into the natural capital terms."

ST10 – "We've got natural capital committee and a natural capital framework. It's great, but when you try to deliver this in reality in business as usual it becomes really challenging. It's kind of fitting, embedding this in your decision-making framework is really difficult."

ST07 – "But with that comes very big responsibility to care for them and nurture them for the future. At the same time trying to have that coexisting with, really coexisting with economic and social aspirations. The obvious example being the Port of Liverpool on the Mersey Estuary. Very heavily designated area for nature conservation but also parts of the beating heart of the economy of our area, the North West England, the national."

ST07 – "I think the second thing is we don't have the benefit of being an urban pioneer something such as that so we don't have the benefit of the investment that people to really look at this on the city region scale. So the level of knowledge is quite patchy."

4.4.3 - Strengths

All 13 participants identified strengths of the natural capital approach. A common theme present throughout all of the interviews (in various phrasing) was that it offers a chance to improve our relationship with the natural environment to the benefit of both humans and nature alike. The majority of participants offered their praises on the opportunity it presents to improve places, which is fundamental to all stakeholders. Another common theme noted by the majority of participants was the as the natural capital concept is broad; it offers the potential to be an effective communication tool and engage a wide audience from varying backgrounds. Less frequent but also notable comments include its potential to leverage significant funding from private sources. Its interaction with business concepts was raised by multiple stakeholders, with its tradability (offering the opportunity to off-set elsewhere) hailed as a significant positive.

ST03 – "Yeah it's a huge opportunity for us all to work together to the same ends really and to have a decent country and a decent world to live in really."

ST09 – "I think it's a great communication tool and it's good because you've got a management plan, you can incorporate it into any business plan and environmental management plan. Well I think you can incorporate them quite easily in business plans. So that's a good strength. The natural capital idea as I said is a good communication tool because not everyone is aware of the environmental issues that are out there. You can communicate it to many stakeholders more easily I think than ecosystem services, than ecological things. The value of spiders in the environment isn't so obvious to everyone."

ST07 – "Oh okay. I think the strength is it's broad. The strength is the language we are using, natural capital. So therefore, you are assigning some form of value to it which I think is important. So that takes you back to quantification. I think the other thing is it does start to introduce the concept of trading movements because if you've got a capital approach that does open up the opportunity of saying almost well so if you lose that capital here maybe you can recreate something bigger and better over here."

ST07 – "I think I like the overall approach of natural capital because it's a wider concept and it's a more embracing concept which has less risk of putting people offside. It kind of starts to deconstruct the economic growth vs. ecology type of old fashioned sort of argument. So, I like it as a concept because actually it goes back to making places decent, resilient places for the future, that place shaping which is actually what it should really be about. So, I can see it has a role."

ST11 – "We're all about place making so the strengths are we're trying to make the best place possible anyway."

ST13- "I think the strengths are the potential to leverage significant finance in ways that haven't historically been achieved. And I think we need to do that in this climate and in this world. So, it's no brainer, we have to do it because we need money to continue improving what we believe in ethically."

ST13 – "It's a way of getting people interested and engaged. There might be a good opportunity to kind of leverage in private funding as opposed to just looking up at public. So, I see that as an opportunity. I see it as an opportunity to just kind of capture people's imagination."

4.4.4 - Weaknesses

11/13 stakeholders stated their perceived weaknesses to the approach, the two that did not comment were speaking on behalf of businesses. The most commonly stated weakness of the approach was that assigning a value (specifically attributed to human usage) to the natural world might not be an ethical action. This was highlighted as a point in which people may struggle to adapt to; meaning public backing of such an approach may be hard to come by. Multiple respondents stated that the regulatory position had to be clarified in statutory terms before the approach had any real potency. The need for a way to link all of the organisations and businesses working on the approach is apparent, with 4/13 stakeholders mentioning disconnects, indicating the right level of communication is not currently present. Free-riding issues were mentioned by 2/13 participants, with no ideas proposed as to how to address them.

ST13 – "The weaknesses are at the moment it's not central government policy. We have Brexit and all of the changes that are potentially going forward. So, we are going into uncharted waters, uncertain times and the weakness is that we're not in a strong position with the word and the term and the philosophy of natural capital quite yet. So, I think we're a little bit further behind the curve then we perhaps need to be in uncertain times. And we have different organisations and businesses as I said working in silos and we need some type of levelling playing field."

ST03 – "That's my point really, it doesn't have to have a benefit to humans. It just has a value in itself. And again, it's almost to the point where we humanize everything and we put an economic value on everything when everything has a place for itself and that's what we miss. We miss that everything is a cycle. And that we have created a great big hole in the cycle. And so, we feel that we have to value it in our own way. Is a much bigger picture than just us."

ST07 – "So natural capital is obviously a slightly broader concept and it is potentially a way of valuing different bits and it potentially provides a framework for sort of monetizing some of that if you like. What else do I want to say about it? I'm concerned that there could be some disconnects and I'm concerned there could be some confusion. It means different things to different people it the first thing."

ST04 – "I think something like natural capital accounting would challenge some people to think differently and I suppose how successful it is will depend on how easy people will adopt and adapt to something new. Something that people maybe traditionally haven't always placed a big value on."

ST02 – "Free-riding issues are the big issues that need to be dealt with. And they haven't been satisfactorily dealt with as yet addressed and so they need to be in due course."

ST09 – "So what's missing is that the actual baseline, the actual to phrase it into the natural capital terms."

ST02 – "I think the regulatory position needs to be clarified and we need to see what's going to come out of that to see where we end up."

5.0 - Discussion

5.1 - Knowledge base in the Liverpool City Region

5.1.1 - Knowledge of ecosystem services

All 13 stakeholders displayed some awareness of ecosystem services as a concept, conforming with Dick et al., (2018) statement, that the ecosystem service (ES) concept is becoming mainstream in policy and planning. However, knowledge of the intricacies in deploying such an approach varied between the stakeholders. Stakeholders within business seemingly had more knowledge as to the intricacies of measuring and assigning a value to ecosystem services. In a study assessing stakeholders' perspectives on the operationalisation of the ecosystem service concept (Dick et al., 2018) the concept was shown to achieve a gradual change in practices: 13% of the case studies reported a change in action (e.g. management or policy change), and a further 40% anticipated that a change would result from the work, whilst reported advantages of the concept align with those who display an understanding of the metrics behind ecosystem service valuation in this study. The ecosystem service approach and ecosystem service valuation efforts have changed the terms of discussion on nature conservation, natural resource management, and other areas of public policy as it is now widely recognized that nature conservation and conservation management strategies do not necessarily pose a trade-off between the "environment" and "development" (De Groot et al., 2010).

5.1.2 - Knowledge of the natural capital approach

The wide range in knowledge of the natural capital approach displayed by stakeholders suggests that although talk of natural capital is now common from governments to corporate boardrooms, successful implementation is still in early stages (Guerry et al., 2015). As government are yet to make the approach official through statutory terms, many stakeholders, namely government and charity workers and are awaiting further information prior to thoroughly engaging in its application. It is clear and unsurprising the businesses interviewed already have significant knowledge surrounding the approach and its application as some mentioned their opportunities to trial the approach and feed back to government on their experience. These conversations are advanced and reflect the wish to be informed so they can stay ahead of the curve whilst conforming with current narrative that was highlighted in research by Davies et al., (2018), that businesses are willing to invest in funding ecosystem services (PES) providing business cases with examples of real benefits are to be made upfront.

5.2 - Policy and Governance

Knowledge on existing policy documents varied significantly amongst the stakeholders interviewed. All stakeholders spoke about the 25-year plan and net gain through which a general theme emerged indicative that stakeholders were awaiting further confirmation of direction from the government in the way of legislation before taking any particular stance. They appeared to look upon the concept of

net gain favourably alongside ambitious statements made in the 25-year plan such as their promise to set gold standards in protecting and growing natural capital – leading the world in using this approach as a tool in decision-making (UK GOV, 2018). Some stakeholders were already using the 25-year plan in reference as a framework for future developments however, comments made about the plan being a vision piece and not an action plan seemed to highlight the majority of concerns surrounding implementation. This aligned with comments made about the net gain approach, with developers claiming DEFRA need to move the goalposts in order to set realistic targets.

Section 106 is a legal agreement between an applicant seeking planning permission and the local planning authority, which is used to mitigate the impact of a development on the local community and infrastructure. It was mentioned by 6/13 stakeholders, all of which looked upon the policy favourably as a tool to pry developer contributions into funding for GI. A suggestion by one stakeholder that section 106 may be used as an incubator, to facilitate large GI opportunities was also offered. It is likely that developer contributions will be key in the successful implementation of a natural capital approach, with innovative funding mechanisms from international payments for ecosystem services to financial and currency transactions taxes to international financing facilities are possibilities for alleviating the funding challenge (Barbier, 2011).

The call for more environmental stewardship rather than just delivering your regulatory requirements in isolation and in silos was apparent, being made by 3/13 participants. Respondents were relatively unfamiliar with future plans regarding the environment bill and 2/3 were sceptical of its execution. The government claim that at the heart of the bill are the new foundations it will create for long-term environmental governance and accountability. They have promised to back this up with a regularly refreshed plan of action, stating the three following steps as key in reaching their goal to set a new trajectory for environmental improvement:

1. Establish a world-leading environmental body, the Office for Environmental Protection (OEP) to champion and uphold standards as we leave the EU.

2. Introduce a clear set of statutory environmental principles to guide policymaking.

3. Place the flagship 25 Year Environment Plan on a statutory footing.

With an interim environment watchdog announced earlier this year - aimed at addressing any gaps in governance until the Office for Environmental Protection is established - delegates will examine the Government's proposals for the design of the body, including its potential role, overarching powers, and how it would be implemented (UK GOV, 2019 [3]). Implications of the updated environmental bill will likely underpin previous documentation and policy, adding statutory weight with consequences felt throughout all sectors, but it is too early to say if this will address stakeholders' doubts about the protection of natural assets.

5.3 - Investment in Natural Capital/Net Gain

The vast majority of stakeholders considered private investment in the natural capital approach plausible, mainly due to CSR benefits. This mirrors statements made at international negotiations to the effect of trillions of dollars of private financing being either available or required (Clark et al., 2018) however, information on the actual spending in various sectors is more frequently stated in the billions of dollars (UN, 2014; Parker and Cranford, 2010; World Bank, 2018). The potential significance of this private contribution in the future was highlighted by one stakeholder, although they deemed funding currently leveraged from a net gain policy as insignificant in the grand scheme of things. One

stakeholder noted the potential for innovative funding mechanisms to drive investment into both net gain and natural capital approaches, however the majority had nothing to say and were largely unaware of such proposed schemes. Comparatively, comments from stakeholder interviews suggest that investment in net gain and NC are driven by different factors. As natural capital currently exists as an optional approach, the purpose of investment proposed by stakeholders lied within the realm of CSR. As biodiversity net gain is proposed as a mandatory approach with legislative drivers, stakeholders indicated a need to invest to meet statutory requirements. This highlights a potential barrier in the implementation of a NC approach, indicating the majority of stakeholders will only focus on mandatory biodiversity net gain and not go beyond to think about environmental net gain and natural capital investment more widely. Only those looking to go above and beyond legal expectations to achieve CSR would currently opt into a NC approach until this is also backed by statutory measures.

Comments from sections 4.3.1 (ST06) and 4.3.3 (ST13) highlight the opportunity for the natural capital approach to pool resources from section 106 and other piecemeal approaches into wider funding pots to establish significant funding. One stakeholder believes this could be used to deliver something more strategically with greater impact than current contributions and they predict this type of approach will become more commonplace in the future. In recent years, 'blending' has become a common development finance term. The practice combines official development assistance with other private or public resources, in order to 'leverage' additional funds from other actors. (Pereira, 2017)

There have been attempts to distinguish how blended finance - the use of development funds to mobilise additional private finance for investment may be utilised and improved to aid in achieving the UN sustainable development goals (Taskforce, B.F., 2018), however recent studies show expectations that blended finance can bridge the SDG financing gap are unrealistic (Attridge, S. and Engen, L., 2019). Other, wider scoping studies have shown that blending can be problematic, displaying it does not necessarily support pro-poor activities, often focuses on middle-income countries, and may give preferential treatment to donors' own private-sector firms whilst commonly fail to incorporate transparency, accountability, and stakeholder participation, the latter of which may translate to issues on a smaller scale (Attridge, S. and Engen, L., 2019).

5.4 - Implementation of the Natural Capital Approach within the LCR

5.4.1 - Barriers/Challenges

All 13 stakeholders commented on barriers/challenges of implementing the natural capital approach within LCR, displaying there are still hurdles to overcome prior to implementation. Embedding the approach into existing frameworks, for both local government and businesses alike was frequently mentioned as a perceived barrier.

None of the stakeholders interviewed articulated perceptions of the environment being a risk of limitation to development; however, it is likely their roles (predominantly environmental – see table 2 in section 3.0) within their respective organisations have shaped their view on the environment vs development debate. Further standalone comments were made concerning doubts about certain environmental management approaches not being tailored to fit with the current scenario, highlighting greater issues for all stakeholders in the North West to find mutual ground in implementing an approach that works for all. With the LCR being an economic and political area including six local authorities with very different driving forces, ensuring the approach meets its aims to aid the integration of ecosystem-oriented management with economic decision-making and development equally across all of the authorities could prove to be a complex procedure. Albeit, it

should be noted that successful collaborative action tends to be developmental in nature, needing time and work to reach a successful outcome (Johnson et al., 2003).

Deploying such an approach at an appropriate time was also stated as being significant in the uptake of implementation. One comment stated that as Liverpool has not been selected for involvement in DEFRA's Urban Pioneer programme, it may not have the investment, tools or support that the neighbouring city of Manchester has to implement a natural capital approach. This is compounded by previous studies assessing collaborative action of stakeholders in natural resource governance, where findings displayed resource availability constrains empowerment, management and biodiversity outcomes (Davies and White, 2012).

As the natural capital approach is not yet supported by statutory legislation, stakeholders appeared to place less of an incentive on pushing to ready themselves for implementation in comparison to the biodiversity net gain approach, which is soon to be made mandatory. This lack of incentive highlights a barrier to implementation, as currently the drivers for implementing a natural capital approach are not strong enough to persuade organisations across all sectors to invest in the approach, with only those looking to achieve CSR benefits, in this case the stakeholders working within large businesses, readily engaging in the concept. The development of regulatory structures may be necessary in order to engage small and medium-sized enterprises (SME's) to enact a behavioural change, whilst also providing minimum standards for many activities covered by CSR (Williamson et al., 2006). It is safe to assume all other stakeholders, including environmental charities and government agencies, will make operational changes according to statutory requirements.

5.4.2 – Opportunities

There are many opportunities presented by the implementation of a natural capital approach in LCR, as suggested by all stakeholders. Liverpool's rich cultural history has already acted as a springboard in facilitating significant development projects following the declaration as European capital of culture in 2008 (Langen and Garcia, 2009). The natural capital approach has the potential to offer some redemption as to the negative reception from some of the public, predominantly those living and operating businesses outside of the city centre, wondering how subsequent developments within the city centre have helped them. It also potentially presents an opportunity to feed into a re-branding of the identity of Liverpool as a more environmental city, matching the Metro Mayors ambitions to be zero carbon by 2040 and the greenest UK City Region (Nature Connected, 2017).

Stakeholders commonly stated that the unique abundance of natural resources present in the North West provides a unique opportunity for growth. Using Liverpool as a testbed for the natural capital approach would allow planners to first understand and then maximise the benefits these natural assets offer through intelligent design and integration. If the approach can be applied effectively within large developments projects predominantly springing up around coastal regions within LCR, there is an opportunity to spread the benefits beyond economic terms, into both environmental and social sectors. The prospect of integrating a natural capital approach offers some exciting outcomes, including the potential to contribute to balancing the proposed four basic types of capital needed to improve subjective well-being: human, social, built, and natural capital (Vemuri and Costanza, 2006). This idea was highlighted by one stakeholder as a chance to create a circular economy model through integrating green infrastructure into the blue economy. They backed the potential outputs of creating a model that focusses on protecting natural assets through increasing biodiversity and resilience to improve the city as a place to live and visit, thus driving increases in growth across all

sectors. This may be particularly positive in an area where poor health has been noted, hindering productivity amongst many other consequences (Woodward and Devaney, 2010).

The advanced position certain stakeholders believe they are currently in with regards to understanding land cover, land use, stakeholder relations and ecosystem services in areas within their jurisdiction offer exciting opportunities to roll out a natural capital approach. This proposed interest from certain stakeholders can also be seen as a huge positive and provides opportunity to trial such an approach in both private and government led scenarios, optimizing the approach prior to wider implementation. Partnered with the nationally renowned environmental leadership, and knowledge found within the LCR (i.e. The Mersey Forest; Merseyside Environmental Advisory Service; Lancashire Wildlife Trust) this means the city region could potentially provide a significant contribution to the national debate on implementation of the 25 year plan and the natural capital approach (Bowe, 2019).

5.4.3 - Strengths/Weaknesses of the Natural Capital Approach

There are many strengths attributed to the natural capital approach. Largely, stakeholders identified its strengths as an accessible communication tool, highlighting its broad parameters as crucial in keeping people onside with the approach. Multiple stakeholders believe that it may prove to be instrumental in "getting people interested and engaged in the environment and capturing people's imagination". More specific strengths attributed to the natural capital approach were associated with its potential for leveraging private funding, with businesses warming to the idea of funding GI (Cranston et al., 2015; Davies et al., 2018), the significance of which is highlighted in section 5.2.

Its ability to interact with business concepts is prevalent, with the semantics surrounding the approach also frequently used within economics and business, offering an opportunity for businesses to engage with the concept using language they are already familiar with. Even the term 'natural capital' itself, alike the ever-present phrase financial capital which all businesses inherently aim to gather, suggests that one would attribute a value to the natural world and that this should no longer be overlooked. It's tradability through offering the opportunity to off-set impacts of development off-site if an environmental positive cannot be achieved, was also hailed as a significant positive and another potential inlet for businesses, with this particular idea being suggested as compatible with business plans.

Criticisms of the approach predominantly lie in the design of the approach itself. Within the study, the most commonly stated weakness of the approach was that assigning a value (specifically attributed to human usage) to the natural world might not be an ethical action. For this reason, the concept itself has been labelled by one stakeholder as something in which the public may struggle to adapt to. However, this further highlights the form the approach wishes to take – a fluid and transferable shape in which businesses can consider buying into. 11/13 stakeholders stated their perceived weaknesses to the approach, the two that did not comment were speaking on behalf of businesses. This suggests that although proving ethically controversial across multiple sectors, the approach seems to fit the bill for those working within business, inferring if its original purpose was to get businesses onside then it is succeeding.

The idea of putting a value on ecosystems can be easily interpreted as an attempt to commodify the natural world, however natural capital proponents do not advocate the 'pricing of nature' and the core assertion can be that prices have failed to reflect the true value of the natural world, in fact indicating that the economic systems we're using are broken. Much of nature is already commodified and the approach could work to illuminate natures often hidden value, with traditional prices almost

never reflecting the immense value of nature. Perhaps the main weakness of the approach, as mentioned by some stakeholders is that it has no legal binding (Williamson et al., 2006), meaning there is a lack of incentive for business to respond to suggestions made in the 25-year environment plan, which one stakeholder (ST05) referred to as a vision piece.

Although there is the potential for businesses to use the approach in their favour, so to speed up planning applications and in turn reduce overall costs of development, it is key for businesses to engage in dialogue surrounding the environment. A capitalist market economy has shaped businesses to benefit from exhausting the available natural assets without being held accountable for the destruction of the environment in the process. The approach offers a way to get businesses onside and work together, with an overall aim of improving places, something in which stakeholders can get behind. This is reaffirmed by ST07 in section 4.4.3 stating: "*I like it as a concept because actually it goes back to making places decent, resilient places for the future, that place shaping which is actually what it should really be about."*

6.0 - Conclusion

Perceptions of the natural capital approach within the LCR vary across the stakeholders interviewed, dependent on metadata, such as sector and/or knowledge of the approach. The ethics of the approach and the semantics surrounding it were contentious topics; however, the majority of stakeholders felt there were opportunities through using the approach as an accessible communication tool. On a whole, stakeholders working within business were the most knowledgeable, enthusiastic and advanced in their preparations for the implementation of a natural capital approach. This highlights the approaches strength in ability to engage the private sector and displays potential to leverage private funding in contribution to GI developments.

Most stakeholders respect that the unique abundance of natural resources present in the North West, partnered with the nationally renowned environmental leadership and knowledge found within the LCR offers the city region an opportunity to potentially provide a significant contribution to the national debate on implementation of the 25-year plan and the natural capital approach. However, there are barriers to overcome prior to widespread implementation, including the need to generate airtight plans to embed the approach into existing frameworks and to improve cross-sectoral communication. There is currently a lack of incentive for the implementation of a natural capital approach across both public and private sectors. This could potentially be alleviated by supporting the approach with statutory legislation, though adjustments to the approach according to recommendations from testbed situations, such as DEFRA's Urban Pioneer programme would likely be necessary prior to this.

The limitations in this study can be predominantly attributed to sample size (n = 13). A larger, more comprehensive project would be necessary to derive concrete plans of action according to stakeholder perceptions. Suggestions for further research to evaluate external influences, including the impact of Brexit on environmental legislation and the influence of neighbouring city Manchester, as one of DEFRA's Urban Pioneers, has on the narrative of perceptions of GI within Liverpool could provide worthwhile insight in aid of further explaining perceptions of key stakeholders within the LCR to the natural capital approach.

Thesis reflection

Overall contributions

Academic contributions

The thesis makes multiple academic contributions, perhaps the most notable of these being chapter 1's contribution to knowledge on WTP for greenspace within low-income communities. The generation of WTP information for low-income areas helps to plug gaps in research in an area that is severely lacking in data. Chapter 1 also embodies an experimental methodology in the form of a choice-contingent valuation study. This methodology has potential to be utilised in further valuation studies and adapted in various ways in order to be fit for purpose across a wide array of research that demands a balance in qualitative/quantitative data and can therefore be seen as both an academic and practical contribution. Chapter 2 offers academic contributions to the field of environmental economics via displaying perceptions of an ecosystem service policy approach within a northern UK city.

Practical contributions and implications

Chapter 2 generates qualitative data that boasts wider practical implications for environmental legislation within the LCR. This can also inform the broader narrative on environmental legislation across the UK. Specifics include current views from key stakeholders within the LCR on existing and proposed legislation including section 106 (current), the net gain approach (proposed implementation in part with the environment bill) and their strengths and weaknesses, perhaps in aid of informing their working relationship within the broader natural capital approach. Perceived strengths and weaknesses of the natural capital approach were elicited, alongside potential barriers and drivers to implementation within the LCR which can inform decision-making and enhance the development of the approach. This shared knowledge will be valuable in tailoring the approach to be ready for implementation and informing/preparing those that must be ready to embed it within the LCR and inform the narrative more widely across the UK.

Across both chapters, there is a mixture of both qualitative and quantitative data fit to inform decision making across varying scales, whether this be informing local authorities about suitable areas to implement GI or displaying perceptions of ecosystem policy approaches to the UK government. This data is summarised in brief in the concluding remarks section below.

Project limitations

Throughout the thesis, there were a number of limitations encountered, which, relating heavily to the overview of strengths and limitations of the project methodology presented in the introduction, point towards potential obstacles and suggested improvements for future studies. Firstly, there must be a recognition of empirical limitations to the wider field of study, irrespective of the quality of research conducted. The field of environmental economics offers only one way of framing environmental challenges; thus struggles to account for any attribute that is not perceived as a service or benefit to humans. This means all hypothetical GI development in this study and subsequent discussions surrounding ecosystem service valuation and environmental legislation mainly concern human interests. Ecosystem services are defined as "the benefits of nature to households, communities, and economies". Any proposed value attributed to nature within the ecosystem services framework does not then account for the intrinsic value of nature itself and can be seen as an undervaluation.

There were attempts to balance any foreseen methodological limitations at the project planning stage so to design a project with the least restrictions. This involved an analysis of stated preference methodologies and their weaknesses, which are covered in brief in the introduction and touched upon in depth in the subsequent chapters where relevant. As expected, this was not entirely conclusive and further limitations were found upon conducting the research. For clarity purposes, it is worth reiterating that WTP methodologies have been linked to over-stated intentions of pay (Christie, 2007), thus any given price should not be taken as absolute and more so as insight into public opinion of greenspace.

Whilst thorough planning had been undertaken to generate and intricate methodology in particular for Chapter 1, there were issues with participant recruitment at the selected study sites in Chapter 1 which led to significant delays in the collection of data. This meant that other parts of the research suffered, with less time being free to allocate to the collection and transcription of data for Chapter 2, the sample size suffered on this behalf (n=13). This can in part be attributed to the length and depth of the semi-structured interview process, for which the demands likely affected the acquisition of participants, deterring those whose knowledge on natural capital was limited or those with significant time restraints. This is likely to have affected project data and therefore non-response bias (Berg, 2005) is something that should be considered in future studies hoping to apply similar methodologies to best effect. To reduce the impacts of time limitations, I would suggest an initial assessment of the scale of project scope and embodied methodologies would be useful in determining the appropriate length of time needed to conduct such studies. Focus should also be applied on choosing suitable study sites for survey data collection, which in turn may significantly reduce the amount of time spent on data collection without negatively affecting the results.

Concluding remarks

Chapter 1 displays that the public within Liverpool assign value to urban GI and are willing to pay, solely for one attribute - a cultural ecosystem service in the form of visual amenity. Applying a choice contingent valuation study (CE) provided insight into public perceptions, showing positive correlation between the economic values a participant would theoretically part with and the level of GI proposed. Though the public are willing to pay for additional GI, as the costs associated with each image increase, the demand for each image reduces highlighting limitations of affordability. There is the opportunity for local councils to reduce the disparity between what features residents wish to see in their ideal view, and wider public benefit, in turn reducing the wedge between private and public needs spoken about by Hanley et al (2016).

Chapter 2 exhibits the potential of the natural capital approach to influence decision-making. If development of the approach continues toward implementation stage within the LCR, local councils may well take account of the positive response offered by the public to the proposed GI in chapter 1 and deem GI in Everton as a worthwhile investment, especially when additional analysis is applied to account for the plethora of additional ecosystem services this infrastructure would provide. However, outcomes of chapter 2 demonstrate that there is not yet the incentive for this to be plausible, especially given that public services are currently stretched and staffing teams are reducing in numbers to coincide with budget cuts. Despite private support for the natural capital approach displaying the potential to engage businesses and potentially leverage private funding in contribution

to GI developments, incorporating them into existing frameworks may still prove to be improbable until there are statutory requirements to do so.

Often overlooked within the context of this study, the ELM System (Environmental Land Management System) has been proposed as DEFRA's vision for the future, subsequently an alternative to the common agricultural policy under EU ruling (European Commission, 2017). Their idea being that it will consist of one flexible contract and one set of guidance underpinned by the natural capital principals, which may well legislate further incentive for the implementation of ecosystem-based approaches. Following recent advancements via the publication of the environment bill (UK GOV, 2019 [4]) declaring biodiversity net gain as mandatory as of October 2019, there are talks surrounding the potential for environmental net gain to become regulated.

If implemented, a combination of ELMS and regulated net gain may provide the incentive required to put the natural capital approach in a position where it can be utilised effectively, though at current political uncertainty leaves us unsure of future actions. Nevertheless, we can hope that increasing interest in the use of economic valuation of ecosystem services and goods leads to informed decisions about the allocation of natural resources, to create a happier, healthier and more equal society.

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8.0 - Appendices

8.1 - Survey

LJMU Mersey Forest Valuing Green Space North Liverpool Questionnaire

Hello, my name is Tom and I am a student from Liverpool John Moores University. I am carrying out a survey to find out more about the environments in which you would like to live. This information will be used to help inform decisions about the ongoing regeneration of urban areas across the North West; specifically this area in particular. Do you have a few minutes to help inform future decision-making concerning the ongoing regeneration in this area by the means of answering a short questionnaire? It will not take very long and any information you provide will be kept strictly confidential. We do not require your name or address; only your anonymous opinion. Please note that by completing this questionnaire you are consenting to be part of the research study and for your data to be used anonymously.

Where You Currently Live

1. **Which of the options below would you say are most important in making somewhere a good place to live?** MULTI-CHOICE UP TO FIVE ONLY
   A. Access to nature
   B. Activities for teenagers
   C. Affordable decent housing
   D. Clean streets
   E. Community activities
   F. Cultural facilities
   G. Education provision
   H. Facilities for young children
   I. Health services
   J. Job prospects
   K. The level of pollution
   L. The level of traffic
   M. Parks and open spaces
   N. Public transport
   O. Race relations
   P. The level of crime
   Q. Road and pavement repairs

R. Shopping facilities

S. Sports and leisure facilities

T. Wage levels & local cost of living

U. Trees

V. Other - state other:

2. From the list below, a) which of the following features would you expect to see in a landscape with your 'ideal view'? and b) which, if any, can you currently see from your property?

(This list is not intended to include everything just some of the things that you typically see in city environments).

	A (tick)	B (tick)
A. Commercial properties (office buildings)		
B. Derelict land		
C. Park or public garden		
D. Grassed area		
E. Shops		
F. Car park		
G. Residential properties		
H. Warehouse/factory		
I. Allotments or farms		
J. Street Trees		
K. Private domestic garden		
L. A body of water (i.e. River, pond, lake)		
M. Outdoor sports facility		
N. Cemetery, churchyard or burial ground		

Local Green Space.

3) On average, how often do you make recreational visits to green spaces in your local area?

A. Never

B. Less than once a year

C. Once a year

D. Every six months

E. Every 3-4 months

F. Monthly

G. Weekly

H. Daily

4) Do you normally visit these local green spaces alone or with your family and/or friends?

A. With family and/or friends

B. Alone

5) In a typical year, how often do you make recreational visits to green area outside your local area (i.e. countryside, coast, woodlands, farms etc.)?

A. Never

B. Less than once a year

C. Once a year

D. Every six months

E. Every 3-4 months

F. Monthly

G. Weekly

H. Daily

6a) Does your house/apartment have garden?

A. Yes

B. No

b) Do you have access to it?

A. Yes

B. No

Local Development Questions

We are interested in finding out how much residents such as you value different views of urban green space. To help us, a series of images of typical green space set in a location close by have been created.

This is typical of the views that you might be able to see from your home.

I am now going to ask you to imagine that you are considering moving house. Supposing that you have looked at all the possible locations you have considered moving to and you have therefore decided on your three favourites. Upon considering the pros and cons you have come to the conclusion that the only significant differences between your options are:

- The view.
- The annual cost of living there i.e. council tax, travelling expenses to both work of education and the rent/mortgage.

I'm now going to show you images of three views – one of which will be from the house with the lowest cost to live there, and the others from houses where it would cost you a little more to live there.

RESPONDENT NUMBER
USED

(LAY OUT THE THREE PICTURES SPECIFIED IN THE ROTATION AND UNDEREACH PLACE THE APPROPRIATE TEXT CARDS)

Choice situation No:	Choice 1		Choice 2		Choice 3	
	I:	V:	I:	V:	I:	V:

Here are pictures of the views that you could see from all three properties. Underneath each picture you can see how much extra it will cost to live in the house with that view (when compared to the base cost of living in the other house.)

Q7 a) Which of the three choices do you prefer? Also, which do you like he least?

BEST	MIDDLE	Worst

Here are three more views, again I'll tell you which of these three is the cheapest, how much per year the others would cost

Choice situation No:	Choice 1		Choice 2		Choice 3	
	I:	V:	I:	V:	I:	V:

b) Can you tell me which choice you prefer this time and which you like the least?

BEST	MIDDLE	Worst

Again, here are three more views, with the same information about each as before.

Choice situation No:	Choice 1		Choice 2		Choice 3	
	I:	V:	I:	V:	I:	V:

c) Can you tell me which choice you prefer this time and which you like the least?

BEST	MIDDLE	Worst

Again, here are three more views, with the same information about each as before.

Choice situation No:	Choice 1		Choice 2		Choice 3	
	I:	V:	I:	V:	I:	V:

d) Which of these three choices would you prefer and which do you like least?

BEST	MIDDLE	Worst

Again, here are three more views, with the same information about each as before.

Choice situation No:	Choice 1		Choice 2		Choice 3	
	I:	V:	I:	V:	I:	V:

e) Which of these three choices would you prefer and which do you like least?

BEST	MIDDLE	Worst

Choice situation No:	Choice 1		Choice 2		Choice 3	
	I:	V:	I:	V:	I:	V:

f) Which of these three choices would you prefer and which do you like least?

BEST	MIDDLE	Worst

<u>Justifying your choices</u>

7. a)

Which ONE of these reasons best explains your reasoning behind the choices you have made? (multi choice select up to 3)

A. I didn't like any of the views so I chose the cheapest option.

B. It's not worth paying extra for a view.

C. It's worth paying more to get a good view.

D. I'd like to live in an area like that.

E. I just chose the least bad alternative.

F. I like that type of scenery best.

G. I can't afford to pay any extra

H. Residents should pay

I. It should come from council tax I already pay

J. Other? (Please specify below)

b) When you were looking at the images, which if any, of the things shown on the card were you thinking about when giving your preference? (multi choice allowed up to 3)

A. Pride in where you live

B. Sense of community

C. Makes the street more attractive

D. Improved water runoff

E. Improves local nature

F. Helps tackle climate change

G. Increases local business revenue

H. Increased investment in the local area

I. Trees may block off the light which is available to residents in their property

J. The tree would become vandalised

K. Increased animal fowling and leaf litter

L. Other? (Please specify below)

Personal Questions

8) The following questions help us to ensure that we have taken a representative sample of respondents in terms of age, occupation etc.

a) Which sex do you classify yourself as?

A. Male

B. Female

b) Which of the age groups on the card do you fall in to?

A. Under 20

B. 20 - 29

C. 30 - 39

D. 40 - 49

E. 50 - 59

F. 60 - 69

G. Aged 70+

c) What are the current occupation(s) of the chief income earner(s) in your household? If more than one state both.

Occupation 1

Occupation 2

d) How many people in your household are:

A. Are Children aged 15 or under?

B. Are Adults aged over 16?

e) Looking at the card, can you tell me which of these categories best describes the stage where you left, or you have reached with regard to formal education?

A. Primary
B. Secondary
C. Undergraduate
D. Graduate
E. Doctorate
F. Vocational Training
G. Other

State Other

f) Into which of the groups on the card does your total annual household income (before tax) fall?

A. Under £15,000 per year
B. £15,000 - £19,999
C. £20,000 – £29,000
D. £30,000 – £39,999

E. £40,000 - £49,999

F. £50,000 - £75,000

G. Over £75,000 per year

H. Refused

g) Do you live locally (in the L3, L4, L5 and L6 post code)?

A. Yes

B. No

h) Do you own or rent your home? If rent, what type of renting.

A. Home Owner

B. Rented – private

C. Rented housing association/council

D. Rented Student Housing

E. Rented – accommodation provided with job

i) Which one of the following options best describes what you are doing at the moment?

A. Full-time employment (30+ hrs)

B. Part-time employment (8-29 hrs)

C. Government training

D. Unemployed- registered (Job seekers allowance)

E. Unemployed- unregistered (actively seeking work)

F. Unemployed- not seeking employment

G. At Home Looking after family

H. Long term sick/disabled

I. Retired

J. Full-time student

K. Other?*

*Other:

Thank you for completing our survey.

8.2 - Orthogonal Design

		Choice 1		Choice 2		Choice 3		
	Choice situation	Image	Value	(image)	(value)	(image)	(value)	Block
Respondent 1	1	0	0	3	3	3	6	3
	2	0	0	4	4	3	5	1
	3	0	0	2	1	2	4	4
	4	0	0	4	5	2	6	6
	5	0	0	1	5	1	5	2
	6	0	0	3	1	3	3	2
Respondent 2	7	0	0	1	5	4	1	1

	8	0	0	2	6	3	1	5
	9	0	0	2	4	2	2	3
	10	0	0	1	1	1	2	6
	11	0	0	1	2	3	1	3
	12	0	0	2	3	1	3	1
Respondent 3	13	0	0	2	2	2	5	5
	14	0	0	4	6	4	4	2
	15	0	0	3	2	3	5	4
	16	0	0	3	6	2	3	4
	17	0	0	3	4	2	3	5
	18	0	0	4	3	4	4	6
Respondent 4	19	0	0	3	1	1	4	5
	20	0	0	1	6	4	2	6
	21	0	0	1	4	4	6	4
	22	0	0	3	3	4	2	5
	23	0	0	2	2	4	3	2
	24	0	0	3	2	2	4	1
Respondent 5	25	0	0	2	3	1	1	4
	26	0	0	4	2	1	3	6
	27	0	0	4	6	1	5	3
	28	0	0	1	6	1	6	1
	29	0	0	3	5	2	1	3
	30	0	0	4	4	1	1	2
Respondent 6	31	0	0	4	5	3	2	4
	32	0	0	1	4	3	4	6
	33	0	0	1	3	2	5	2
	34	0	0	2	5	3	6	5
	35	0	0	2	1	4	6	3
	36	0	0	4	1	4	2	1

8.3 - Participant Occupations

Participant ID	Occupation 1	Occupation 2
1	Administrator	
2	Doctor	
3	N/A	Pensioner
4	N/A	
5	Project manager	Property developer
6	N/A	
7	Highways consultant	Property developer
8	Builder	
9	Transport planner	
10	Senior Lecturer	
11	NHS Administrator	
12	Police Officer	
13	N/A	
14	Civil Engineer	
15	Tree Surgeon	
16	Student	
17	Tattoo Artist	Student
18	Student	
19	N/A	
20	Retired	
21	Broadcast engineer	
22	Retired	
23	Student	
24	Paramedic	
25	Sales Assistant	
26	Customer service advisor	NHS receptionist
27	IT Administrator	Administrator

28	Retired	Retired
29	Homemaker	
30	Supply teacher	Nurse
31	N/A	
32	N/A	
33	Bin man	
34	Paramedic	Retail management
35	Retired	
36	Student	
37	Retired	
38	Unemployed	
39	Secondary school teacher	
40	Dental nurse	
41	Self-employed	
42	Caretaker	Receptionist
43	Teacher	Teacher
44	Student	
45	Accountant	
46	Student	
47	Brick-layer	
48	Roofer	Nurse
49	Student	
50	Bus Driver	Teaching assistant
51	Homemaker	
52	Police Community Support Officer (PCSO)	
53	Student	
54	Heavy Goods Vehicle (HGV) driver	
55	Traffic warden	
56	Secretary	
57	Council employee	
58	Student	

59	Retired	
60	Carer	
61	Dock worker	Retired
62	Receptionist (GP surgery)	
63	Retired	Retired
64	Unemployed	
65	Warehouse operator	Brick-layer
66	N/A	
67	Retired	
68	Teacher	
69	Nurse	
70	Administrator	
71	Caterer	
72	Teacher	Sales assistant
73	TV sport production assistant	Night support worker
74	TV sport production assistant	Night support worker
75	Night support worker	TV sport production assistant
76	Teacher	
77	Warehouse operator	
78	Teacher	Retired
79	PHP developer (Hypertext Pre-processor)	
80	Student	
81	Student	
82	Engineer	
83	Library & student IT advisor	Customer Care
84	Estate Agent	
85	Education	
86	Human resources manager	
87	Mechanical engineer (CNC setter, programmer, operator)	

88	Retired	Retired
89	Retired	Retired
90	Receptionist (GP surgery)	

8.4 - Average household income in the UK

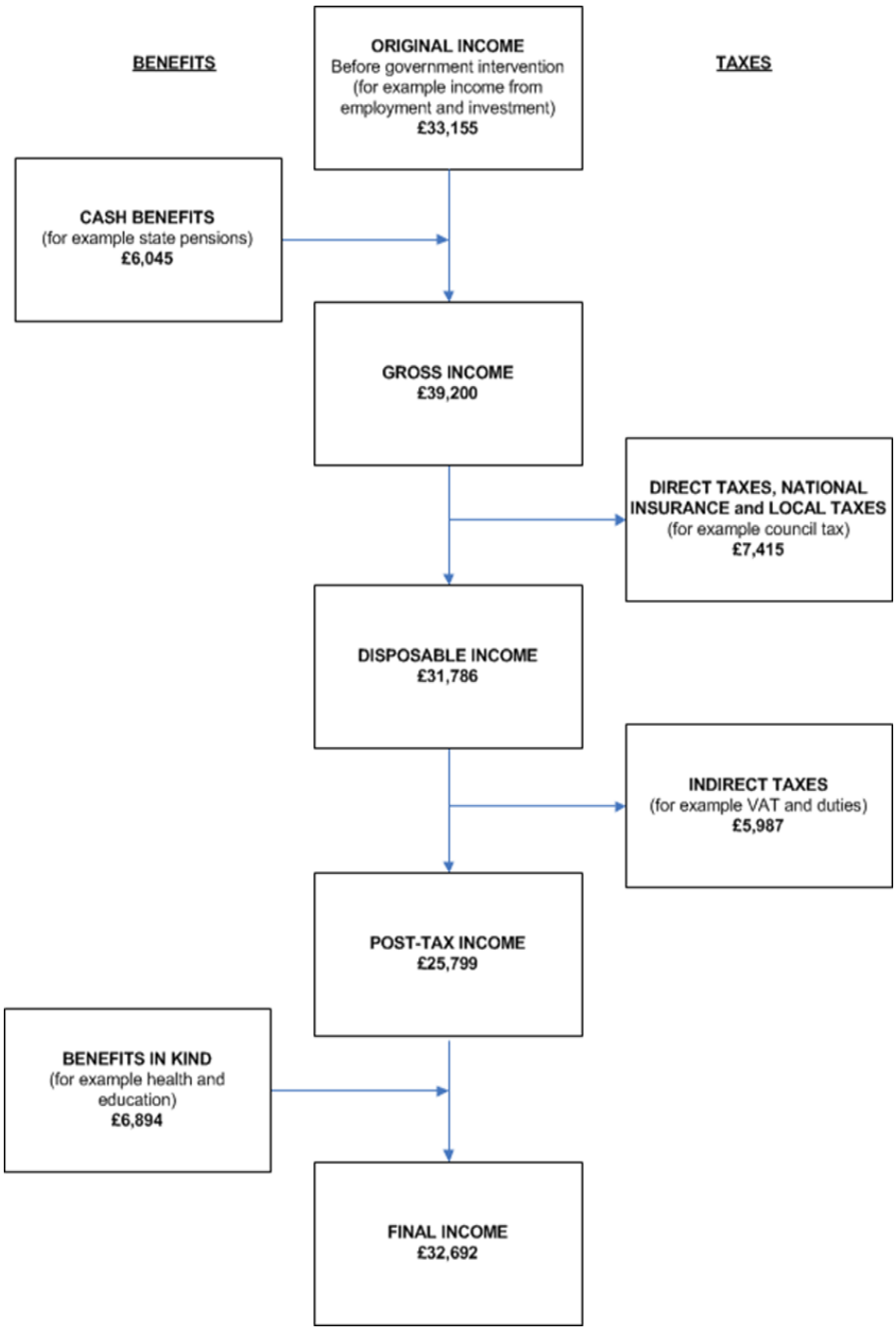

Figure 24: A diagram displaying average household income, cash benefits and taxes in the UK from the financial year ending in 2014. (Tonkin, 2015)

8.5 – UK employment rates according to the Office for National Statistics – Labour Force Survey (2019)

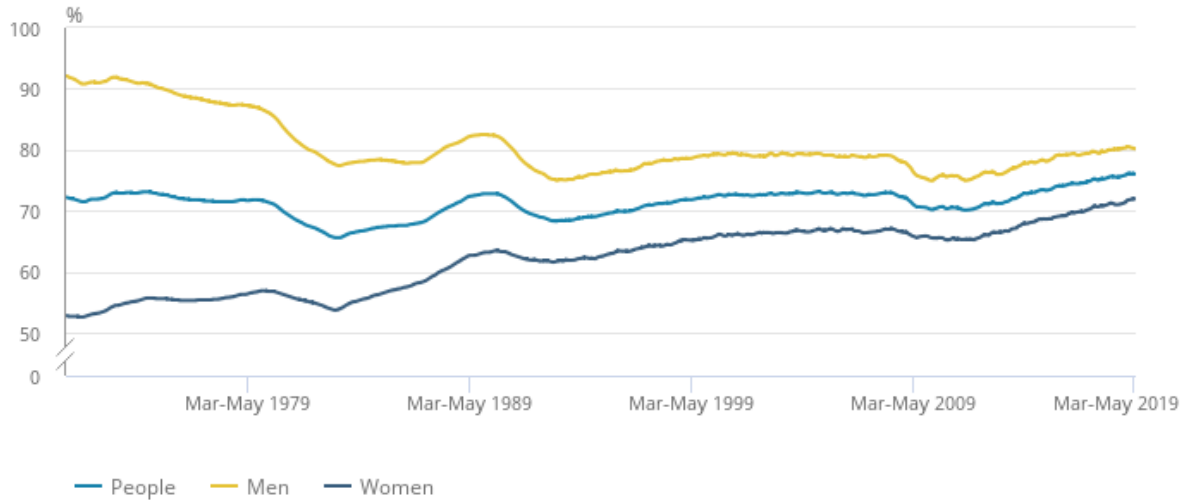

Figure 25: UK employment rates (aged 16 to 64 years), seasonally adjusted, January to March 1971 to March to May 2019. Source: Office for National Statistics – Labour Force Survey

8.6 – Semi-structured Interview Framework

LJMU Nature Connected Natural Capital Semi Structured Interview Questions

We would like to discuss with you your views on implementing a natural capital approach (as set out in the 25 Year Environment Plan) within the Liverpool City Region and its relevance to your organisation and sector

What is the role of your organisation?

Tell us a little about your role?

How is the natural environment (natural capital) relevant (material) to your organisation?

- Impacts and dependencies on natural environment
- Environmental Legislation
- Decision making
- Influence

Natural Capital Approach

- Knowledge of DEFRA policy developments - 25 Year Environment Plan, Agriculture Bill and Environment Bill
- Knowledge and familiarity in concept of natural capital and ecosystems services
- Understanding of the Natural Capital Approach
- Strength and weaknesses of the natural capital approach

How is the Natural Capital approach relevant to the organisation?

- Natural Capital Metrics and Accounting- benefits and barrier to use
- Use of natural capital in decision making

Implementation of the natural capital approach in policy within the Liverpool City Region (importance of/impact of on organisation/city region)

- Spatial Development Strategy
- Visitor Management Strategy
- Section 106, Community Infrastructure Levy (CIL), National Planning Policy Framework
- Net gain (biodiversity and environmental)
- New land management approach (ELMS) (agricultural bill)
- Environmental Bill (Office of Environmental Protection, Environment Improvement Plan, Polluter pays etc.)

Investment in natural capital

- Motivation/barriers for investment
- Developing innovative funding mechanisms and market-based approaches (links to policy)

Barrier and opportunities to the implementation of natural capital approach

8.7 – 'Personal Questions' - Socio-demographics of participants in Chapter 1

Responses to "Personal Questions" Section in Chapter 1 Survey (Appendices 8.1). Question 8.c Omitted as displayed in appendices 8.3.

Personal Questions			
8. a)	**Which of the following do you classify yourself as?**		
Code	**Response item**	**Frequency**	**Percentage %**
A	Male	50	55.56
B	Female	40	44.44
C	Other	0	0.00
8. b)	**Which of the age groups on the card do you fall into?**		
Code		**Frequency**	**Percentage %**
A	Under 20	6	6.67
B	20-29	29	32.22
C	30-39	15	16.67
D	40-49	13	14.44
E	**50-59**	14	15.56
F	60-69	9	10.00
G	70+	4	4.44
8. d)	**How many people in your household are:**		
Code	**Response item**	**Frequency**	**Percentage %**
A	Are children aged 15 or under?	51	19.69
B	Are Adults aged over 16?	208	80.31
8. e)	**Can you tell me which of these categories best describes the stages where you left of you have reached with regard to formal education?**		
Code	**Response Item**	**Frequency**	**Percentage %**
A	Primary	0	0.00
B	Secondary	30	33.33
C	Undergraduate	16	17.78
D	Graduate	26	28.89
E	Doctorate	2	2.22
F	Vocational Training	12	13.33
G	Other	1	1.11
		3	3.33
8. f)	**Into which of the following groups does your total anual household income (before tax) fall?**		
Code	**Response Item**	**Frequency**	**Percentage %**
A	Under £15,000	11	12.22
B	£15,000 - £19,999	10	11.11
C	£20,000 - £29,999	17	18.89

D	£30,000 - £39,999	13	14.44
E	£40,000 - £49,999	8	8.89
F	£50,000 - £59,999	9	10.00
G	£75,000 +	1	1.11
H	Refused	17	18.89
	N/A	4	4.44
8. g)	**Do you live locally in the L3, L4, L5 or L6 postcode?**		
Code	**Response Item**	**Frequency**	**Percentage %**
A	Yes	49	54.44
B	No	40	44.44
	N/A	1	1.11
8. h)	**Do you own or rent your home? If rent, what type of renting.**		
Code	**Response item**	**Frequency**	**Percentage %**
A	Home Owner	42	46.67
B	Rented - Private	30	33.33
C	Rented - Housing council/ association	8	8.89
D	Rented - Student accomidation	8	8.89
E	Rented - Accomdation provided by job	0	0.00
	N/A	2	2.22
8. i)	**Which one of the following options best describes what you are doing at the moment?**		
Code	**Response Item**	**Frequency**	**Percentage %**
A	Full-time employment (30+ hrs)	47	52.22
B	Part-time employment (8-29 hrs)	6	6.67
C	Government training	0	0.00
D	Unemployed- registered (Job seekers allowance)	1	1.11
E	Unemployed- registered (actively seeking work)	0	0.00
F	Unemployed- not seeking employment	2	2.22
G	At home looking after family	4	4.44
H	Long term sick/ disabled	0	0.00
I	Retired	11	12.22
J	Full - Time Student	12	13.33
K	Other?	0	0.00
	N/A	7	7.78