

Understanding the Acceptance of Biodiversity Net Gain and its Implications for Social Licence to Operate

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Abstract

We are in the midst of a global biodiversity crisis, to which economic growth and development are accepted to be significant contributors. In response, organisations and governments are increasingly introducing biodiversity net outcome policies, which promise 'win-win' solutions for nature and development. Mandatory Biodiversity Net Gain (BNG) in England is one such policy, requiring that the majority of new terrestrial developments demonstrate a 10% increase in biodiversity 'value' according to a habitat-based metric. However, net outcome policies have a controversial history, leading to concern from developers that BNG will negatively impact acceptance and projects' Social Licence to Operate (SLO), thereby increasing operational risk. This thesis seeks to understand the acceptance of BNG in England and what this means for project-level SLO. A novel conceptualisation of SLO is derived to provide the conceptual framework for acceptance used within this PhD, finding that acceptance can be understood through the lenses of legitimacy and trust, with strong governance structures being important where trust is lacking. The historical context of BNG in England is addressed by creating a timeline of BNG in England, solidifying its existence as part of a neoliberal push for development-friendly biodiversity policy. To understand acceptance of BNG in England as a policy, a mixed-methods approach is adopted, using questionnaires to evaluate public opinions, and qualitative analysis of responses to an early government consultation to precipitate issues that may impact acceptance. This finds that BNG is widely accepted but a lack of trust, alongside the policy's neoliberal aims, and multiple value conflicts, threaten acceptance in practice. Finally, the Norwich Western Link, a controversial proposed road project, is used as a case study to assess the impact of BNG on SLO, finding that BNG further polarises judgements of the project, and may negatively impact SLO where impacts are perceived to be unacceptable.

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Chapter 1 Introduction

We are in the midst of a global biodiversity crisis (Ceballos et al., 2015; Humphreys et al., 2019; Pimm et al., 2014). Current conservation efforts are failing to address declining biodiversity, as shown by the failure to meet any of the Aichi biodiversity targets agreed in 2010 (Greenfield, 2020; Vaughan, 2020). If this trend is not reversed, we are likely to continue seeing habitat loss and species extinctions, leading to the loss of intrinsic value and essential ecosystem services such as climate change mitigation (Griscom et al., 2017) and adaptation (Oliver et al., 2015); food security (Isbell et al., 2017); and mental health and wellbeing (Marselle et al., 2019). These impacts are likely to be unequally distributed across the Earth's population, aggravating existing patterns of inequality (Fussel, 2009).

Economic growth and development are accepted to be a significant contributor to environmental degradation (Rosales, 2008). However, it is currently, neither socially desirable nor politically feasible to avoid all development, for example the UN Sustainable Development Goals (SDG) call for development of infrastructure networks (SDG 9) and continued global economic growth (SDG 8) (Bull et al., 2020; Bull & Milner-Gulland, 2020; Hickel, 2019; Spaiser et al., 2017). Without further intervention, the development required to meet such socioeconomic goals is incompatible with achieving both ecological targets (Hickel, 2019; Spaiser et al., 2017) and social targets reliant on ecosystem services (Díaz et al., 2019). To reconcile growth and development with addressing the biodiversity crisis, legislation is increasingly moving towards net-outcome type policies (Bull et al., 2020; zu Ermgassen et al., 2021), in which the biodiversity 'value' of a site is measured and compared before and after development, usually using a standardised numeric metric. Examples of net-outcome policies include no net loss (NNL), in which the 'value' of habitat after development must be no less than before, and biodiversity net gain (BNG), in which the 'value' of habitat after development must be greater than before (Bull et al., 2020; zu Ermgassen et al., 2021).

Within net outcome policies, developers are expected to follow the mitigation hierarchy, avoiding and minimising harm where possible (Bull et al., 2020). There is some scepticism as to whether the mitigation hierarchy is always followed as expected (Cares et al., 2023), for example, negative environmental impacts are often deemed non-significant in environmental impact assessment, allowing projects to go ahead even where some level of negative impact is likely to occur (Murray et al., 2018). This means that, even after nominal avoidance and minimisation, some level of ‘unavoidable’ residual harm remains (Phalan et al., 2018). Where a net outcome approach is taken, these residual harms must then be quantified and compensated for, through on-site improvements or off-site offsets, such that biodiversity is left measurably no worse (for NNL) or better (for BNG) than prior to the development (Bull et al., 2020). This requires the quantification and comparison of loses and gains (Bull et al., 2020), with the measurements used depending on the scale at which BNG is being applied, and the types of biodiversity it is being applied to (Moilanen & Kotiaho, 2018). These measurements are typically made with reference to a ‘metric’ that provides consistency over the measurements made (Carreras Gamarra et al., 2018). The process of reducing biodiversity to measurable and comparable “units” is deeply uncertain (Wauchope et al., 2024) and requires acceptance of the assumptions that biodiversity can be measured and replaced, both of which are disputed (see e.g. Apostolopoulou & Adams, 2015; Sullivan & Hannis, 2017).

The move from Biodiversity Offsetting (BDO) aiming to achieve No Net Loss (NNL) of biodiversity to BNG is not trivial, as it requires defining the point at which you are (acceptably) certain that a gain will occur (Bull & Brownlie, 2017) in the face of certain losses and uncertain gains (Weissgerber et al., 2019). There are arguably four main approaches to over-compensating for biodiversity losses and achieving BNG, three that revolve around offsets (Moilanen & Kotiaho, 2021) and a further one that uses a combination of offsets and other forms of compensation (Bull et al., 2020). Of the three methods described in Moilanen and Kotiaho (2021), the first is to apply a positive multiplier to the offsets required for no net loss so that more biodiversity is created/restored/protected than was lost during development, resulting in an overall gain. The second method is to use slowly

maturing gains, such that they reach no net loss within a given time period, after which biodiversity value created due to, for example, increased habitat maturity and distinctiveness, constitutes the net improvement. The third method is to offset the full value of the development site elsewhere, thus allowing any biodiversity that is either protected or created on site to be a net improvement. One further approach, considered in Bull et al. (2020) is to carry out offsetting to the point of no net loss, then produce gains through out-of-kind compensation such as reducing poaching pressure.

BNG exists within the global economic context of continued economic growth and development and is often described as a form of neoliberal conservation (e.g. Apostolopoulou & Adams, 2019). This is for three main reasons. Firstly, the potential involvement of markets in biodiversity trades (Koh et al., 2019). Secondly, the potential for BNG to contribute to the privatisation of nature through offsets being provided by private landowners (Knight-Lenihan, 2020). Finally, and potentially most significantly, the aim of some BNG policies to streamline the development process through reducing delays and uncertainties (Knight-Lenihan, 2020), which has the potential to increase the number of developments that get approval, increasing the amount of nature impacted by development (Jones et al., 2019).

Views on biodiversity offsetting range from outright rejection to qualified acceptance amongst both experts and civil society. This presents significant legitimacy issues for developers, threatening their 'social licence to operate' (SLO), defined in this thesis as 'the level of approval that an industry, organisation, or project realises from its stakeholders' based on Thomson and Boutilier's early and influential work (e.g., Thomson and Boutilier, 2011). In this thesis, I take the example of England's recently mandated BNG policy to begin to understand how BNG interacts with SLO and what this might mean for organisations.

1.1 Social Licence to Operate and the importance of understanding the acceptance of Biodiversity Net Gain

Social licence to operate is a nebulous concept, which continues to incite conversation on what exactly it is, and how to measure it (Prno, 2013). Broadly speaking, it is used to refer to the extent to which stakeholders, primarily the local community impacted, accept a project, organisation, or industry (Gunningham et al., 2004; Jijelava & Vanclay, 2017; Syn, 2014). SLO can be considered to exist where an industry, organisation or project has ongoing acceptance and approval from stakeholders to conduct its activities (Prno & Slocombe, 2012). SLO can be gained and lost at different levels, from single projects to whole industries (Boutilier, 2014). I present a thorough exploration of the components of SLO and how they fit together in Chapter Two.

SLO was first adopted as a concept due to increasing concerns over the negative social and environmental impacts of corporate activity (Parsons et al., 2014) to draw attention to the need for companies to consider local communities during operations (Boutilier, 2014). Originally, SLO was primarily used in relation to extractive industries such as mining, but the concept has since expanded into other industries (Saenz, 2019). The expansion and increase in importance of SLO has been attributed to two mechanisms: the shift in governance from state to non-state actors; and the increase in prevalence and perceived importance of the sustainability paradigm (Prno & Slocombe, 2012). This process of communities demanding more involvement in decision making and holding organisations to higher standards is thought to be responsible for much of organisations going 'beyond compliance', where they exceed regulatory requirements (Gunningham et al., 2004; Prno, 2013).

Thompson and Boutilier (2011) suggest that SLO is inversely related to the level of socio-political risk experienced by an organisation, with lower SLO indicating higher risk and vice versa. Disapproval from stakeholders has been shown to have the potential to hinder projects and infer extra costs (Boutilier, 2014). This pressure can be exerted through multiple pathways, such as: physical damage to property,

delays and lost production, court orders, regulatory action, revocation of licenses, reputational loss, difficulty obtaining finance and insurance, distractions to staff, and loss of access to new sites (Jijelava & Vanclay, 2017). As such, it is in an organisations' interests to act in a way that maintains positive SLO judgements from their stakeholders in order to continue operating. Where projects are essential or socially desirable, such as renewable energy, the establishment and maintenance of SLO becomes in everyone's interest.

From an operational risk point of view, it is important to consider that the approval of powerful stakeholders reduces socio-political risk more than that of less powerful stakeholders (Boutilier, 2014). However, the preferential treatment of more powerful voices can lead to negative justice outcomes with negative externalities of projects, even those that are socially desirable on a wider level, becoming concentrated in communities with less access to the resources required to oppose them (Roddis et al., 2018). For this reason, I consider SLO judgements at the level of the individual, such that they can be used to inform practice without incorrectly assuming consensus or implicitly discounting less powerful voices (see Chapter Two for more information).

Biodiversity compensation policies have been found to contribute to the establishment and continuation of SLO in spite of environmentally harmful activities (Richert et al., 2015), thus reducing the socio-political risk faced by the organisation (Boutilier & Thomson, 2011). However, the uncertainty and disapproval surrounding BNG policies has the potential to negatively impact organisations' social licence to operate. Notably, some reject the fundamental assumptions of net outcome policies (Apostolopoulou & Adams, 2015) and they are unproven in their ability to produce the promised net outcome (zu Ermgassen et al., 2019, 2021). Further concerns exist around impacts on access to nature (Jones et al., 2019) doubts about who is responsible for the long-term survival of gains (Blackmore, 2020), and moral questions surrounding the valuation of nature (Björnberg, 2020). The controversy surrounding BNG poses a significant problem for developers as, even when developments follow legislation and best practice guidelines, they can receive criticism from experts and civil society (Scholte, 2019). It is thus important to understand how BNG interacts with SLO such that

organisations can ensure they are following acceptable approaches to nature and thus better manage their operational risk, particularly in the face of mandatory net gain policies like that in England.

1.2 Biodiversity Net Gain in England

BNG was mandated in England in February 2024 after being legislated for in the Environment Act (2021). The policy represents the culmination of a decades long push towards market-based policy instruments, including the trialling and eventual abandonment of biodiversity offsetting in the 2010s (see Chapter Three for a full timeline of the stages that led to mandatory BNG in England). Mandatory BNG in England is managed through the planning system and requires developments to show a 10% uplift in biodiversity (i.e. positive multiplier approach) according to the statutory biodiversity metric (Defra, 2024). Information about the metric can be found in Defra's user guides (Defra, 2023e), a summary of which is provided here.

The statutory metric is designed to measure biodiversity loss and gain in a consistent way that is simple enough to minimise the additional burden for developers and Local Planning Authorities, who are in charge of assessing BNG plans (Defra, 2018a). Within the statutory metric, the net biodiversity change is calculated as the habitat value after development (any retained habitat that was there originally + newly created and/or enhanced habitat) minus the baseline habitat value before development (Figure 1).

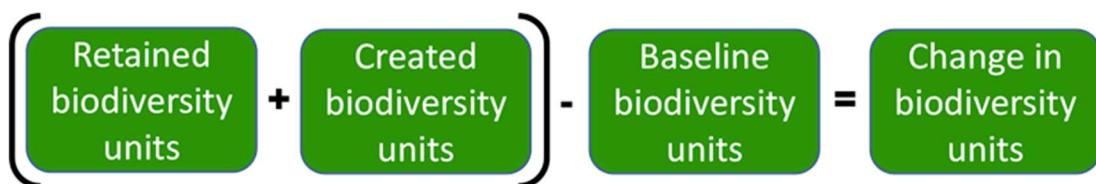


Figure 1: Calculation for net change in biodiversity units within the statutory metric for BNG.

The baseline unit calculation includes all habitat that will be impacted by the development, including land that will be used for compensation. Baseline biodiversity units are calculated using: habitat area, in hectares; distinctiveness,

the relative scarcity of the habitat and its importance for nature conservation; condition, how good an example of the habitat type it is; and strategic significance, how important the habitat is in that location (Figure 2).

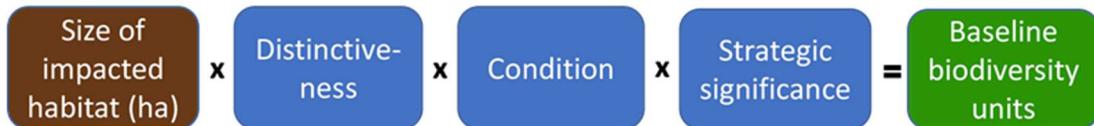


Figure 2: Calculation for baseline biodiversity units within the statutory metric for BNG.

For the habitat value after development, retained biodiversity units are calculated as the amount of original habitat remaining after development using the same formula as baseline biodiversity units. For habitat creation and enhancement, there are additional uncertainties and a risk of failure to create or improve the biodiversity unit value of a habitat. As such, for created biodiversity units, further multipliers are included in the metric calculation to account for this risk: difficulty, the difficulty and uncertainty of successfully creating, restoring, or enhancing a habitat; time to target condition, which accounts for the time lag between the negative impact on biodiversity and the compensation reaching the required quality; and off-site risk, to disincentivise habitat being provided a large distance from the habitat that has been damaged. As the risk multipliers are set to values less than or equal to 1, this will typically increase the size of the habitat required as compensation above the size of habitat lost or damaged (Figure 3).



Figure 3: Calculation for created biodiversity units within the statutory metric for BNG.

Units can be created through increasing the distinctiveness or condition of habitats through habitat creation, restoration, or enhancement. This may be done by the developer on or off site, alternatively developers may buy existing biodiversity units that have been registered on the national habitat register or, as a last resort, buy statutory biodiversity units from the government. The created or enhanced habitats will often take a number of years to reach their predicted value

and must be maintained for at least 30 years from creation, secured through legal agreements such as conservation covenants. Trading rules exist within BNG to limit habitat fungibility such that where the habitat lost is high distinctiveness, such as lowland mixed deciduous woodland, the created or enhanced habitat must be of the same type. For more common/abundant habitat types, such as most agricultural land, the replacement habitat may be of equal or higher distinctiveness. Habitats that are very high distinctiveness, for example ancient woodlands, are deemed 'irreplaceable' under biodiversity net gain and a project cannot claim overall net gain if such habitats are damaged.

English BNG represents an important case study as it is the largest scope net outcome policy globally, covering all developments within the scope of the Town and Country Planning Act (1996) and, from November 2025, Nationally Significant Infrastructure Projects (NSIPs) which fall outside the Planning Act and are approved centrally by Government rather than locally by local planning authorities. This approach is increasingly being used in other countries and contexts (White & Panks, 2024). Additionally, there has been and continues to be substantial excellent research on BNG in England, providing excellent context for this thesis.

1.3 What is the positionality and approach of this PhD?

1.3.1 About myself

I am a novice researcher in social sciences and somewhat more adept and experienced within the realms of environmental sciences. As such, many aspects of this PhD (including writing this positionality statement) have felt somewhat uncomfortable due to falling outside of my comfort zone of being able to point to a statistic or number to justify my views and findings. In this discomfort, there have been many moments of self-doubt, I still feel uncomfortable calling myself a social scientist, for example, as I recognise there is a wealth of knowledge and experience that I currently lack and can only hope to gain through further years of research, challenge, experience, and working collaboratively with others more experienced than myself. There has, however, also been substantial personal growth, I believe,

that having been forced to face my own biases and have a deeper understanding of the steps and stages that have led to constructing, as opposed to ‘finding’, a research conclusion has made me a better scientist and researcher.

I have always loved nature, and animals specifically. This is often criticised as an exaggeration, which perhaps it is, but many of my earliest memories involve animals, whether that be pets or those in Standalone Farm in Letchworth, the town where I spent the first four years of my life. I am lucky to have parents who appreciated, although did not always particularly share, this enthusiasm and it was not many birthdays before animal encyclopaedias were at the top of my wish list. This ties into another aspect of my identity: I am autistic, having been diagnosed during my PhD after a long time of questioning. It is hard to know exactly how this impacted my PhD, as I have never not been autistic so have no frame of comparison, but I do believe it has led to a sense of dissatisfaction and inability to move on until the point where I feel I truly and fully understand a concept or phenomenon; something that has both helped (leading to outputs such as my SLO conceptualisation in Chapter Two and BNG timeline in Chapter Three) and hindered (through the time taken to come to these conclusions and outputs when often a more surface-level understanding would’ve sufficed) this project.

I have followed a highly academic (specifically scientific, taking biology, chemistry, physics, and maths at A-level) path to get to this point, which, during my late teens, was also associated with a deep embrace of positivist ideology, believing that everything could ultimately be explained by maths. This led me to study Natural Sciences at Cambridge, where both of my parents are also alumnus, during which time I shifted focus to ecology and conservation, doing my final year dissertation on the traffic dynamics of leafcutter ants. My undergraduate degree further built my wonderment about the natural world and instilled a sense of urgency around the need to conserve nature, both to avoid the tragedy of its loss and to maintain the ecosystem services we rely on.

In the final year of my undergraduate, I developed a keen interest in evidence-based conservation, largely due to Professor William Sutherland, one of my lecturers. Driven by this interest, and an internship working with the Red List

team at BirdLife International in the summer between my first and second years, I developed a masters project looking at evidence use within the IUCN Red List profiles of birds, which I undertook during the COVID period supervised by Prof. Sutherland after a short summer studentship with the bird department at Jersey Zoo. It was also in the last year of my undergraduate that I began to learn more about fortress conservation and the potential justice implications of conservation action, albeit taught by well-meaning ecologists as opposed to social scientists. It was around this point I became convinced that conservation does not and cannot work in isolation but instead operates within a number of complex political spheres meaning that projects and methods must not only be well evidenced, but also satisfy a diverse range of stakeholders. It was with this underlying belief that I looked for PhD projects that straddled the interface between people and conservation.

1.3.2 About the project

This project, as proposed, set out to provide an answer to the question “How can we achieve biodiversity net gain?” in CASE partnership with Anglian Water, a large business with a net gain policy (to offset at least 110% of the biodiversity value lost). At the point the project was proposed (August 2019), the UK Government had expressed their intention and proposed methods for mandating BNG but the legislative process had not yet begun, there were many differing offsetting policies and methods and little consensus on the point at which net gain is achieved, as well as controversy around whether it was an appropriate approach. As discussed, this entailed considerable operational risk for Anglian Water, given their BNG commitment, and this project aimed to understand how net gain could be delivered with minimal reputational risk. The research questions and objectives were as follows:

Original research questions:

1. What is the evidence for the efficacy of different net gain policies?
2. What expectations do different stakeholders, including civil society, have of net gain?

3. How can a business deliver net gain with least risk to their reputation?

Original objectives:

1. conceptualise net gain based on global policy and practice;
2. identify the expectations of different stakeholders, including civil society, of net gain;
3. evaluate existing approaches to the delivery of net gain; and
4. determine how Anglian Water can deliver net gain in their region with minimum risk to their SLO.

This PhD project interested me as it provided an opportunity to combine my experience of evidence-based conservation with the need for methods to also satisfy stakeholders. At this point, I believed BNG could be effective and legitimate, but not unless an evidence-based approach was taken, nor without satisfying a diverse range of stakeholders. I was conscious of my primarily biological training, so aimed to improve my political skills and understanding of the impact that conservation actions can have on different stakeholders. As part of this, I did not feel I had the vocabulary or expertise to comment on some of the criticisms levelled at biodiversity offsetting, such as the policy representing the neoliberalisation of nature. I also appreciated that the collaboration with Anglian Water would allow me to use my enthusiasm for evidence-based conservation to make a tangible difference to biodiversity and conservation. I recognised the potential for this work to be used to justify development, something that I did not (and still do not) want, and appreciated that the collaboration was with the water industry which is where I feel a net outcome approach is justified because, for all of the issues and controversy surrounding it, improvements to our aging water infrastructure is one of the essential and justifiable development needs.

Much had happened by the time this PhD started (February 2021), and it was somewhat of a whirlwind as COVID-related delays during my master's had meant I handed in less than 24h before my first PhD meeting. Perhaps the most important change, however, was the legislative progress that had been made on mandating BNG in England, with the Environment Bill 2019-20 (as the Environment Act (2021) was called prior to Royal Assent) having passed its Third

Reading in the House of Commons. This substantially changed the scope of the project as businesses no longer had freedom as to how they defined and achieved BNG, meaning the focus was now singularly on how best to carry out the (then thought to be) soon-to-be-mandated approach. Further, it quite quickly became apparent that evaluating the efficacy of net gain policies alone was enough for multiple PhDs, see for example the wonderful work by Natalie Duffus and Ivonne Salamanca on the effectiveness of the Defra biodiversity metric as a tool for measuring biodiversity. As such, the first two research questions were simplified into one aim:

Aim One: To understand the acceptance of mandatory Biodiversity Net Gain as a policy.

Addressing this aim forms the main body of this thesis, encompassing Chapters Two through Five. I will present them here chronologically, as opposed to in the more narratively sensible order in which they appear in the thesis, to give a more accurate representation of the thought process behind this work. To begin, particularly given my relative inexperience with social sciences topics, I reviewed the literature on SLO, only to find very little consensus as to what it actually was, giving rise to the first objective of this PhD:

Objective One: To create a comprehensive and descriptive conceptual framework for an individual's social licence to operate judgement formation. (Chapter Two)

The next objective was:

Objective Two: To understand the issues that may threaten acceptance of mandatory BNG in England. (Chapter Five)

For this, I began an inductive qualitative analysis of responses to the 2018-19 Defra consultation on Net Gain, which I saw as a vast existing source of information on people's opinions of BNG across a range of stakeholders. This ended up being a much larger piece of work than I expected, spanning all four years of my PhD. During this process, I realised historic context would be essential to understand how views carried over from previous policies and approached might impact the

acceptance of BNG and, what began as a quick aside, quickly evolved into a whole chapter with the objective:

Objective Three: To chronicle the events have led to BNG in England looking as it does today and understand the context this provides for the SLO of BNG now. (Chapter Three)

Objective Three was achieved through creating a comprehensive timeline of BNG in England and the policies that preceded it. At first this was done through literature review, starting with the documents referenced in the 2018-19 consultation and snowballing out from there. Later, it included the input of many of the most influential members of the BNG community in England, each of whom provided insight into the process that could not be gleaned from publicly available documents alone, for this I am very thankful. The importance of this work has been widely recognised, reflected in the pre-print having over 400 downloads.

Finally, with regards to Aim One, towards the end of my PhD I had additional funds available and was conscious that the Defra responses, although a rich and valuable source of information, only consisted of interested and knowledgeable respondents and thus may not be representative of the wider English public's attitudes to and acceptance of mandatory BNG. As such, an additional objective was added to more fully understand acceptance of BNG in England:

Objective Four: To evaluate (i) how much the English public know about BNG, (ii) what they think about BNG as a policy and (iii) what impacts this. (Chapter Four)

For this, I used a market research panel to gather questionnaire responses from a (broadly) nationally representative sample of the English public and presented a broad-brush quantitative analysis.

Further changes arose due to difficulty finding case studies with significant impacts where organisations were willing for me to 'poke around' and ask questions about their approach to BNG and the public's opinion of it. For example, Anglian Water's main project, relocating a sewage treatment works in Cambridge,

had been met with significant controversy (Brown, 2024) and thus there was concern that my research may impact planning outcomes. This meant I had to look for case studies that would work without access to internal stakeholders. Further, it seemed important to understand how BNG interacted with SLO and operational risk before giving recommendations as to how organisations can minimise said risk. This gave rise to the second aim of the project:

Aim Two: To understand how Biodiversity Net Gain impacts the SLO of development projects.

After much stress and deliberation, I decided on the Norwich Western Link, a local and controversial proposed road with substantial environmental impacts and a stated aim of achieving BNG for all applicable habitats, with the objective:

Objective Five: To evaluate and assess the influence of BNG on SLO judgements for a real-world controversial case study. (Chapter Six)

This was intended to be addressed using a mixed methods quantitative → qualitative approach, using questionnaire responses followed by interviews with civil society stakeholders with a range of views. Sadly, due to time constraints, whilst a number of insightful interviews have been conducted, they have not been fully analysed and thus are not included in this thesis. It remains a task to be completed in the future, subject to funding. Within both the questionnaire and interviews, I took a broadly outsider approach, striving for 'empathetic neutrality' (Ormston et al., 2014 per Darwin Holmes, 2020): I am not part of the activist movement against the road, although I have close friends who are; nor have I ever strongly supported a development, having always lived in well-off leafy urban places with good access to public transport and all necessary amenities.

A summary of all chapters, their objectives and contributions to the narrative is given in Section 1.4.

1.4 Chapter summaries

The body of this thesis is presented as discrete ‘journal article’ style chapters, the resultant multi-author publications are listed in Appendix 1. See Table 1 for an overview of each chapter and their contribution to this thesis’ narrative.

Table 1: A summary of the chapters

Chapter	Key Questions/Ideas
Chapter One: Introduction	Chapter objective: To establish the rationale, aims, and positionality of this PhD thesis.
Chapter Two: Conceptualising Social Licence to Operate Alice Stuart, Alan Bond, Aldina M.A. Franco, Julia Baker, Chris Gerrard, Vittoria Danino, Kylie Jones, Conceptualising social licence to operate, Resources Policy , Volume 85, Part A, 2023, 103962, ISSN 0301-4207, https://doi.org/10.1016/j.resourpol.2023.103962 .	Novel conceptualisation of SLO focussing on how individuals form a judgement on the SLO of a project or organisation, used implicitly as the framework underpinning the understanding of acceptance throughout this thesis. Required as previous research on SLO, is disparate in terms of components of SLO and tends to consider groups, not individuals. Chapter objective: To create a comprehensive and descriptive conceptual framework for an individual’s social licence to operate judgement formation. Findings: <ul style="list-style-type: none">• SLO judgements consist of judgements about whether the actors involved can be trusted and whether their actions are legitimate.• Legitimacy can be split into cognitive, whether the project or organisation fits with the individuals’ worldview; moral, whether the project or organisation is seen as doing the ‘right’ thing; and pragmatic,

	<p>whether the project or organisation is seen as net beneficial.</p> <ul style="list-style-type: none"> Within the formation of judgements, being trusted increases legitimacy and vice versa. Broadly, I believe SLO results from the iteration of the following stages: stakeholders form perceptions from the available information; these perceptions go through cognitive processing to create judgements; judgements are expressed (or not) as actions; these actions may impact the organisation positively, negatively, or not at all to result in the final SLO outcome. <p>Contribution to Narrative:</p> <p>SLO can be largely understood through the lenses of trust and legitimacy, with a contribution of individual characteristics determining the information people are exposed to and how it is interpreted. Where actors are not trusted, strong governance structures are required to provide confidence that promised outcomes will be achieved. Positive SLO judgements help operational outcomes but will not always be sufficient for operations to continue and are not essential where stakeholders lack power.</p>
<p>Chapter Three:</p> <p>How England got to Mandatory Biodiversity Net Gain: A Timeline</p> <p>Alice Stuart, Alan Bond, Aldina M.A. Franco, Chris</p>	<p>Timeline of the development of BNG policy in England, required as context for the political motivations behind BNG and past events that may shape people's opinions in the present.</p> <p>Chapter objective:</p> <p>To chronicle the events have led to BNG in England looking as it does today and understand the context this provides for the SLO of BNG now.</p> <p>Findings:</p>

<p>Gerrard, Julia Baker, Kerry ten Kate, Tom Butterworth, Joseph Bull, Jo Treweek, How England got to Mandatory Biodiversity Net Gain: A Timeline (July 01, 2024). Pre-print Available at SSRN: https://ssrn.com/abstract=4883170 or http://dx.doi.org/10.2139/ssrn.4883170</p> <p><i>Accepted by Ambio</i></p>	<ul style="list-style-type: none"> Establishes that BNG is closely related to the failed attempt to legislate for biodiversity offsetting (BDO) in England. Sets BNG as part of a wider push for market-based instruments, with the dual aims of deregulation and facilitating green growth, typical of a neoliberal policy. Establishes that throughout the policy's history, providing benefits for development has been a priority. Begins to reveal the conflict between a system that is easy to use and delivers benefits for development and a system that comprehensively protects biodiversity. <p>Contribution to Narrative:</p> <p>BNG has a long history in England and has been developed to address conflicts between development and the environment, with the neoliberal aims of deregulation and allowing continued economic growth.</p>
<p>Chapter Four: Public Opinions of a Net Outcome Policy: The Case of Biodiversity Net Gain in England</p> <p>Alice Stuart, Alan Bond, Aldina M.A. Franco, Public Opinions of a Net Outcome Policy: The Case of Biodiversity Net Gain in England.</p> <p>Major Revisions</p>	<p>Quantitative analysis of survey responses from 500 people in England, representative by age and gender, looking at knowledge and opinions of BNG. Required as much of our existing knowledge of acceptance of BNG comes from highly motivated and/or knowledgeable stakeholders.</p> <p>Chapter objective:</p> <p>To evaluate (i) how much the English public know about BNG, (ii) what they think about BNG as a policy and (iii) what impacts this.</p> <p>Findings:</p> <ul style="list-style-type: none"> Most respondents knew little about BNG but accepted the fundamental assumptions that habitat restoration can offset development losses, and biodiversity can be measured with standardised metrics.

<p>(Journal of Environmental Management)</p> <p>Available at SSRN:</p> <p>https://ssrn.com/abstract=5035590 or http://dx.doi.org/10.2139/ssrn.5035590</p>	<ul style="list-style-type: none"> High levels of distrust toward most BNG actors, except for ecological consultants and wildlife charities, with trust in these two actors an important factor in acceptance. Those who chose to learn more about the biodiversity metric were more likely to accept that it is possible to measure biodiversity with a standardised numeric metric. The policy was generally accepted, with over half of respondents feeling that a project's environmental impact is acceptable if it achieves BNG, potentially easing project approval risks. Over 80% of respondents believed developers should be responsible for habitat creation and management, with many opposing the use of pre-existing biodiversity credits. <p>Contribution to Narrative:</p> <p>Despite the conflicts within the policy, BNG appears to be popular and have legitimacy, with most people agreeing BNG should be mandatory in England. Where people are not positive about the policy, this appears to be due to a lack of cognitive legitimacy. For some people, this can be 'solved' through providing more information but for others it is based on a fundamental rejection of the underlying assumptions.</p>
<p>Chapter Five: Investigating the Acceptance of Mandatory Biodiversity Net Gain Using Government</p>	<p>Qualitative analysis of individual and some organisational responses to the 2018-19 Defra consultation on (Biodiversity) Net Gain. Required to begin understanding the issues that may threaten the acceptance of mandatory BNG policy and practice.</p> <p>Chapter objective:</p>

Consultation Responses	<p>To understand the issues that may threaten acceptance of BNG.</p>
<i>Manuscript in preparation</i>	<p>Findings:</p> <ul style="list-style-type: none"> • 75.5% of respondents agreed BNG should become mandatory, this percentage was higher in individual respondents (83.6%) than organisations (56.0%). • Those that did not want BNG to be mandated gave the reasons: BNG did not work; BNG would only work if certain extra conditions were met; or that it would be overly onerous for developers and landowners. • There was considerable concern about the assumptions underlying BNG (i.e., that the lost habitat is replaceable and that it is possible both to measure biodiversity losses and to provide gains relative to the baseline) and that the motivations for BNG were overly pro-development and 'green growth'. • There was substantial conflict regarding what BNG should prioritise, including: how pragmatic or comprehensive the methods and requirements of the policy should be; whether compensation should be local or strategic and the extent of access to compensatory sites; and how flexible the policy requirements should be. • Most actors involved in BNG were not trusted, either due to a perceived lack of resources (local authorities and Natural England) or through having vested interests (developers, local authorities, and Natural England); wildlife charities were the exception to this. • There was a strong desire for BNG to be robust and enforced such that it would genuinely provide a means of holding developers accountable for their biodiversity

	<p>impacts, including the need for the involvement of independent actors to ensure impartiality.</p> <p>Contribution to Narrative:</p> <p>The multiple aims of BNG under neoliberalism lead to inevitable and potentially unsolvable conflict between the policy being simple enough to have positive outcomes for development and comprehensive enough to protect biodiversity. This means that legal compliance is unlikely to be enough to achieve acceptance in many cases and even where organisations go beyond compliance, it may not satisfy the priorities of all stakeholders. To address this, organisations will likely have to be transparent and honest about the values that have been prioritised within BNG plans and genuinely engage with the communities from whom they seek acceptance.</p>
<p>Chapter Six:</p> <p>Can biodiversity net gain influence social licence to operate? Evidence from a controversial road proposal in England</p> <p><i>Manuscript in preparation</i></p>	<p>A questionnaire-based analysis of the Norwich Western Link, a controversial road case study. Required to understand how acceptance of BNG impacts SLO of projects in practice, as opposed to solely looking at acceptance in isolation.</p> <p>Chapter objective:</p> <p>To evaluate and assess the influence of BNG on SLO judgements for a real-world controversial case study.</p> <p>Findings:</p> <ul style="list-style-type: none"> • Perceptions of social and environmental impacts are positively correlated, with those against the road perceiving both the social and environmental impacts to be negative, in contrast to those not against the road who tended to perceive that the social impacts will be positive and environmental impacts will be neutral or positive.

	<ul style="list-style-type: none"> • Judgements of the NWL's plan to address biodiversity impacts were highly associated with project rejection. • This appears to be mediated by confirmation bias and respondents' beliefs in whether BNG is possible. • Most (80.5%) of those against the NWL do not believe BNG is possible, meaning this new policy mechanism is unlikely to make their SLO judgements more positive. <p>Contribution to Narrative:</p> <p>Within this project, and likely other environmentally controversial projects too, BNG appears to only provide legitimacy with stakeholders who already accept the project for its wider/social impacts. Those who reject the project due to its environmental impacts do not believe in the principles behind BNG therefore it does not make their SLO judgement more positive.</p>
<p>Chapter Seven:</p> <p>Discussion, recommendations, and conclusions.</p>	<p>Chapter objective:</p> <p>To set the findings of this PhD in the context of previous work and understand what this means for organisation going forwards, including recommendations on how to minimise the operational risk associated with BNG.</p>

Chapter 2 Conceptualising Social Licence to Operate

2.1 Abstract

In the 25 years since its inception, the concept of social licence to operate (SLO) has become widely used within both industry and academia. Despite this, there is no agreement as to what SLO is and what is required to achieve it. This conceptual ambiguity results in organisations struggling to understand how to achieve SLO and leaves many cynical about its use. Through literature review, this chapter brings together existing conceptualisations of social licence to operate, presenting an explanatory model for how individuals form SLO judgements. I highlight four key stages in the formation of an SLO judgement: the assimilation of information by the individual; the formation of perceptions about the project; the application of cognitive processes to these perceptions; and the formation of legitimacy, trust, and overall SLO judgements. Next, I highlight the role of actions as the link between SLO judgements and operational outcomes. I note that where individuals' negative SLO judgements are suppressed, or they lack power over organisations, they will not have an impact on operations, causing an uncoupling of SLO judgements and operational outcomes. This uncoupling can also occur if operations are halted for non-SLO related reasons. This model represents a greater level of detail as to the process by which individuals form SLO judgements than previous conceptualisations, thus providing a clearer understanding of how the components of an SLO interact with each other.

2.2 Introduction

2.2.1 What is SLO?

The popularisation of social licence to operate (SLO) as a term is generally attributed to ex-Placer Dome Director of International and Public Affairs, Jim Cooney (Cooney, 2017). In the face of globalisation, mining companies were

operating in countries where they faced uncertain reactions and anti-globalisation sentiment (Gjølberg, 2009; Miller, 2014). Further, whereas previously relationships between mines and local communities had largely been ‘out of sight of the rest of the world’ (Cooney, 2017, p. 198), the communications revolution provided greater opportunity for impacted communities to inflict financial and reputational damage, increasing their potential to have a negative impact on operations (Morrison, 2014). Cooney used the term to highlight the increasing need for industries to go beyond regulatory requirements imposed by a country to manage and minimise socio-political risk (Cooney, 2017; Edwards et al., 2016).

SLO is widely considered to represent the ongoing acceptance, approval and support from communities and/or stakeholders (Black, 2013; Business for Social Responsibility, 2003; Cleland, 2013; Joyce & Thomson, 2000; Parsons et al., 2014; Thomson & Boutilier, 2011) however, the definition of ‘stakeholder’ and who should be included in it is still disputed (Boutilier, 2020). Other authors focus on the presence of, and requirement to meet, societal demands and expectations (Business for Social Responsibility, 2003; Gunningham et al., 2004; Howard-Grenville et al., 2008; Thornton et al., 2003) and norms (Harvey, 2011), some of which may be tacit (Howard-Grenville et al., 2008), beyond any legal requirements (Business for Social Responsibility, 2003). Some focus on the procedural aspects, defining SLO as the ‘continuous engagement process ... to build trust and obtain legitimacy, leading to dynamic levels of consent or rejection’ (Leeuwerik et al., 2021, p. 5). Alternatively, Salim (2003) presents a rights-based definition of SLO as the right for Indigenous peoples and other impacted groups and individuals to participate in decision making and give free prior and informed consent (FPIC) throughout the project’s lifecycle.

Given these potentially contradictory, definitions and approaches (Cooney, 2017; Dowd & James, 2014; Hall, 2014), SLO remains a nebulous concept which continues to incite debate on what exactly it is and how it can be measured (Jijelava & Vanclay, 2018; Moffat et al., 2016). The use of the term ‘licence’ is much disputed as it implies a binary state, where organisations have an SLO handed to them by a single ‘community’ without which they cannot continue operations (Dare et al., 2014; Parsons & Moffat, 2014). Instead of this, it is widely agreed that

SLO is intangible, unwritten and tacit (Bice et al., 2017; Franks & Cohen, 2012; Parsons & Moffat, 2014). Almost all projects have a multiplicity of stakeholders, all of whom are subject to different norms and expectations that must be adhered to in order to garner acceptance (Dare et al., 2014), doing away with the concept of a single licence. Further, feelings about a project can vary in strength, meaning there are different levels to which stakeholders can accept an organisation and/or project ranging from complete absence of SLO to full trust and psychological identification (Boutilier & Thomson, 2011; Thomson & Boutilier, 2011).

SLO has been contextualised as one of three 'licences' required for an organisation to operate: the SLO, the legal licence to operate (LLO), and the political licence to operate (PLO) (e.g. Bice et al., 2017; Morrison, 2014). Unless they wish to be criminalised, organisations must follow all regulations and laws related to their activities, thus fulfilling their LLO (Boutilier, 2020; Brueckner et al., 2014; Leeuwerik et al., 2021; Morrison, 2014). The PLO represents the need for governmental and political approval for organisations to undertake activities (Brueckner et al., 2014; Morrison, 2014) 'based on its contribution to the state's development agenda' (Brueckner et al., 2014, p. 315). The PLO and LLO are outside the scope of this chapter, however it is recognised that they are critical for an organisation to operate in any specific context and represent important contextual background for the SLO.

This chapter will define SLO as 'the level of approval that an industry, organisation, or project realises from its stakeholders' based on Thomson and Boutilier's (2011) early and influential work as it remains general enough to encompass many of these diverse understandings of SLO.

2.2.2 Why does SLO matter?

Many organisations create negative environmental and social externalities (e.g. Parsons et al., 2014; Shaw, 1992) and are therefore seen as acting out of place (Gjølberg, 2009; Miller, 2014). Failing to address issues that matter to stakeholders can lead to protest (Jijelava & Vanclay, 2017) which can incur substantial costs and cause reputational damage (Franks et al., 2014). Protest can take many forms and

has a wide range of potential impacts (Hanna et al., 2016). These impacts can occur to both the organisation and the project itself (Franks et al., 2014; Vanclay et al., 2015) and may spill over to other organisations in the industry, for example through making more stringent regulations politically expedient (Jijelava & Vanclay, 2017). Stakeholders have a genuine power to impact, and in some cases entirely halt, operations (Edwards & Lacey, 2014; Jijelava & Vanclay, 2018; Miller, 2014; Syn, 2014) representing the sociological reality underpinning the need for SLO (Miller, 2014).

To manage and mitigate the risk associated with poor stakeholder relations, organisations, particularly those in the extractive industries, have begun adopting SLO as a business imperative (Cooney, 2017; Miller, 2014). This represents a heightened awareness of maintaining good community relations to manage socio-political risk associated with stakeholder opposition, reducing the impact on operations (Hall, 2014; Jijelava & Vanclay, 2014; Miller, 2014). In some cases, to claim positive SLO, organisations conceptualise SLO at a level easier to control by restricting issues to a local level, minimising regulatory impositions, marginalising dissent and managing their reputation (Parsons et al., 2014). This approach is often accompanied by a lack of acknowledgement of stakeholders' ability to withdraw SLO (Dowd & James, 2014; Parsons & Moffat, 2014) and ultimately acts to reduce the influence of communities on operations (Parsons & Moffat, 2014).

Treating SLO solely as a business practice or sociological reality does not reflect the actual needs and demands of the impacted stakeholders, with little clarity as to whether SLO requires any more than avoiding inciting sufficient opposition to halt operations (Miller, 2014; Syn, 2014). Thus, in these cases SLO depends less on stakeholder opinions and more on the willingness and capacity of stakeholders to act in a way that halts operations (Syn, 2014). Stakeholders often lack the power required to halt operations, meaning that even if they reject a project, there may be negligible impacts on the project or company (Syn, 2014; Wilson, 2016). Under this approach, communities that are poor, marginalised, weak, divided or disempowered in some other way are left unable to withdraw SLO and at risk of suffering from industrial bad practices (Miller, 2014; Wilson, 2016).

To address this, many authors have highlighted the importance of concepts such as free, prior and informed consent in SLO (Bice et al., 2017; de Jong & Humphreys, 2016; Koivurova et al., 2015; Morrison, 2014; Taylor & Mahlangu, 2017), acknowledging 'the right of communities to grant and/or withdraw their permission for businesses or other organizations to locate and undertake activities within their jurisdiction' (Miller, 2014, p. 388). This approach sees SLO as an evolving form of governance (Miller, 2014), promoting communities' human right to self-determination (Vanclay, 2017) and addressing calls to move away from industry definitions of SLO designed to allow continued operation (Syn, 2014). It also promotes the consideration of social risk, the potential negative impacts and perceived threats faced by the community itself when dealing with SLO (Bice et al., 2017), as opposed to focussing on the risks to the organisation.

Thus, the importance of SLO is in the explicit recognition and consideration of the financial, reputational and community risks associated with failing to meet stakeholder needs and expectations.

2.2.3 How is SLO achieved?

Understanding how SLO is gained is essential for the management of risk and planning of associated monitoring within organisations genuinely looking to acquire and maintain an SLO (e.g. Boutilier and Thomson, 2011) while avoiding claims of green-washing (Hamann & Kapelus, 2004; Vanclay, 2017). Further, understanding how SLO is gained reduces the ability of organisations to legitimise controversial actions through claiming SLO without justification (Bice, 2014; Gehman et al., 2017; Owen & Kemp, 2013; Parsons & Moffat, 2014). Therefore, there is a pressing need to understand how to gain an SLO.

Many conceptual questions remain, hindering our understanding of how SLO is gained. One set of questions queries which stakeholders need to accept a project for it to legitimately claim to have SLO (Boutilier, 2014; Brueckner & Eabrasu, 2018). Along these lines, Wüstenhagen et al. (2007) developed a triangle model detailing the three types of acceptance: Sociopolitical (acceptance of ideas and technologies by stakeholders); Community (acceptance by local stakeholders);

and Market (acceptance and perpetuation by the market). However, separation of SLO by stakeholder group leads to questions over how to weight differing stakeholder opinions in the case of conflict (Boutilier, 2014, 2020). Further, the extent of consensus required within and between stakeholders is still uncertain (Boutilier, 2014; Jijelava & Vanclay, 2014; Wilburn & Wilburn, 2011).

Given this lack of consensus on who constitutes as a stakeholder, for the purpose of my research I will propose a new definition for stakeholder within SLO: “a person, group, or organisation with a stake (interest) in the subject activity, whose interest is not solely political or legal in nature”. This draws on the generic definition presented by McGrath and Whitty (2017) adapted to include only those who can make a judgement on the acceptability of a project or organisation (i.e. a person, group, or organisation) and exclude those whose interest is solely political or legal in nature to accommodate for the separation between SLO, political licence to operate, and legal licence to operate (Bice et al., 2017; Morrison, 2014). This chapter will focus on the individual level as decision-making and change is influenced heavily by the actions of individual change agents (Munduate & Bennebroek Gravenhorst, 2003). I recognise this does not address the dynamics between individuals and power disparities that occur to form organisational or group judgements, however I argue it is a necessary first step in understanding the process of SLO formation.

There are also questions around elements required to achieve SLO. There are multiple overlapping and, in cases, conflicting conceptualisations of SLO (e.g. Bice et al., 2017; Boutilier and Thomson, 2011; Leeuwerik et al., 2021; Moffat and Zhang, 2014; Parsons and Moffat, 2014; Prno and Slocombe, 2014; Thomson and Boutilier, 2011). Methods of measuring SLO have been developed (e.g. Boutilier and Thomson, 2011; Moffat and Zhang, 2014; Richert et al., 2015), however each relates to a particular conceptualisation, meaning they may be missing important elements and understanding. Explanatory models of SLO have been produced, such as the Narratives and Networks model in Boutilier (2020), which depicts the formation of an SLO as a process of ‘socio-political churn’.

2.2.4 Objectives and structure

This chapter aims to identify and draw together existing conceptualisations of SLO into an over-arching meta-conceptualisation. This will help to draw together disparate conceptualisations into a holistic and internally consistent framework. To do this, I will first extract the main components of SLO from the existing literature. I will then use existing conceptualisations of legitimacy and trust formation to develop a model of the process of arriving at an SLO judgement for an individual stakeholder, and the impacts of this on SLO outcomes. This model will form the basis of future empirical investigations around how SLO is gained.

2.3 My approach

To address this aim the following three questions are asked:

1. What are the key components in a comprehensive descriptive conceptual framework for an individual's social licence to operate judgement formation?
2. How do these components fit together?
3. What does this suggest with regards to how organisations can improve their SLO?

Answering these questions will allow the creation of a conceptualisation structured around the components and sub-components involved in determining SLO. To do this, the existing literature, drawn primarily from peer-reviewed journals with some use of books and reports, is reviewed. As the literature is large and rapidly expanding (Santiago et al., 2021) this review does not represent an exhaustive coverage of the literature, rather it focuses on literature presenting novel conceptualisations of SLO.

Following Jabareen (2009), the first step in creating a conceptual framework is to find the relevant literature. To do this, Scopus was searched on 25 March 2022 using the term:

TITLE(("social licence" OR "social license")) AND TITLE-ABS-KEY((conceptuali OR framework OR model) AND (present* OR propose* OR introduc* OR novel OR new OR overarching OR combine*))*

This search returned 55 results covering a period from 2007-2022 (with all results shown in Appendix 2 supplementary data Table S1). Four papers were removed in the first pass (one duplicate, two papers where full text was inaccessible, and one non-English language paper) leaving 51 results. The abstracts and titles were then manually filtered to assess whether they presented a novel conceptualisation of SLO, determined by whether they contained components or relationships absent in previous conceptualisations, leaving 30 sources. Five key conceptualisations referenced within the results that had not been returned in the Scopus search and two papers suggested by reviewers were also added (Appendix 2 supplementary data Table S2), although I recognise that this search strategy may have excluded relevant papers.

Next, each paper was read, and all components included in the chapter's conceptualisation of SLO were identified and categorised (Appendix 2 supplementary data Table S3). These components were then deconstructed into their basic ideas, categorised by type and, where appropriate, combined to reduce the total number of components and simplified into a holistic and internally consistent framework. These were then combined with existing conceptualisations of legitimacy and trust, as these components dominated the existing conceptualisations identified, to produce an explanatory model of SLO.

2.4 Results and discussion

Figure 4 sets out the culmination of the method and models the process leading to individual SLO judgement formation and its influence on organisational outcomes. The following text will explain how the process of establishing an SLO develops, albeit the many interrelationships mean the process is unlikely to be linear. The relationships between components within the meta-conceptualisation have each been given a letter, used in the text below to explain the nature of each relationship.

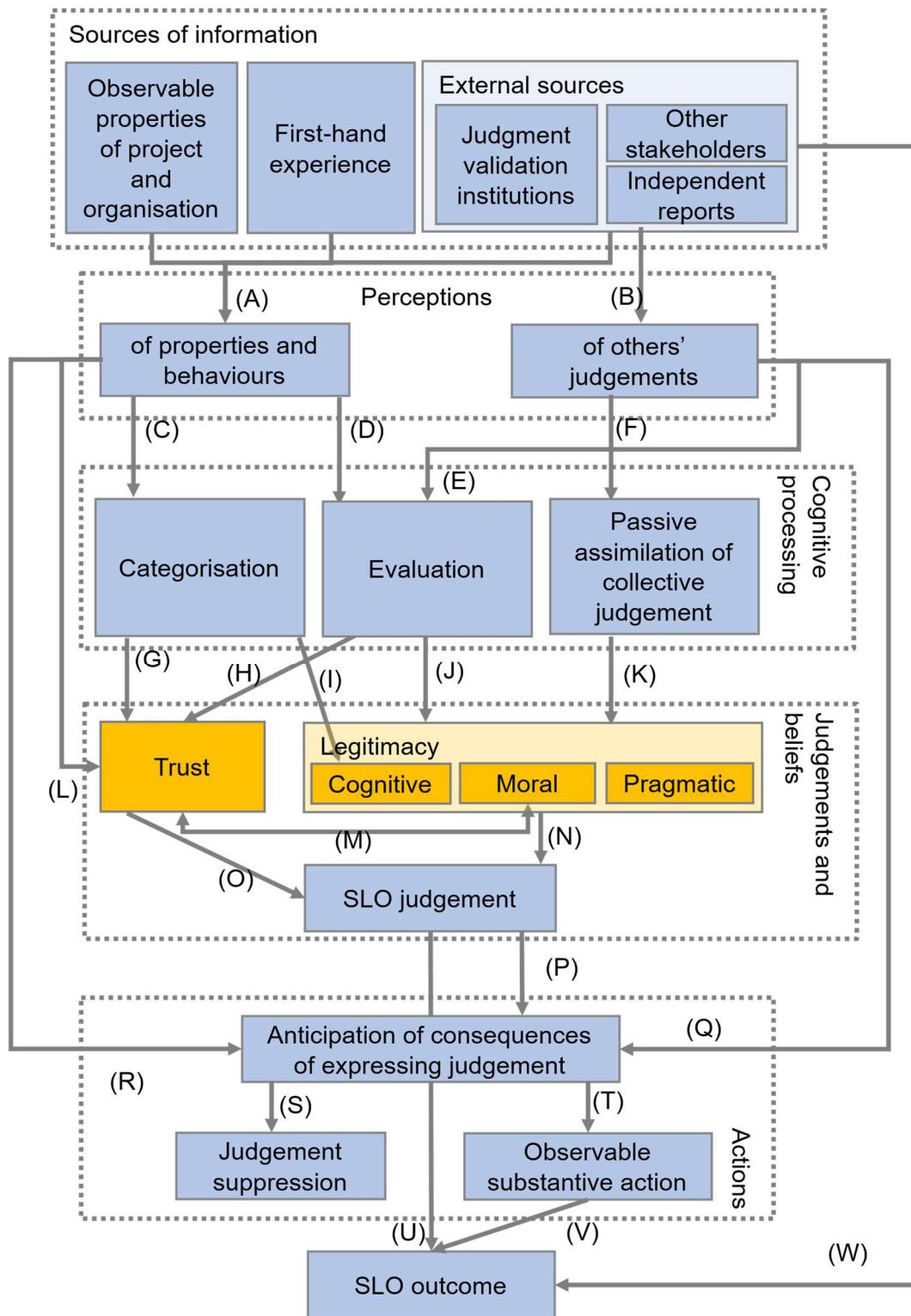


Figure 4: Model of the process determining SLO outcomes from an individual gaining information about operations to their actions impacting the overall SLO outcome.

Legitimacy and trust are highlighted as the two fundamental components of previous SLO conceptualisations.

2.4.1 Sources of information

As SLO is determined by stakeholders, it is built from individual perceptions based on the information available to them (Tarnopolskaya & Littleboy, 2015) as opposed to some objective ‘truth’. The information used to build these perceptions can come from different sources. Information may come via first-hand experience, through direct impacts or being involved in the organisation’s engagement (Dare et al., 2014). It may come from observable properties of a project and/or organisation (Bitektine & Haack, 2015). Alternatively, information may come from second-hand sources such as other stakeholders, who may have direct experience of the project impacts or engagement (Dare et al., 2014) or may be ‘gossiping’ about things they have heard (Sommerfeld et al., 2007), or independent technical reports (Billing et al., 2021; Luke, 2017; Saenz, 2019).

Other sources, such as the media, government and the judicial system, act as ‘judgment validation institutions’, which represent ‘critical sources of validity that fundamentally influence other evaluators’ judgments’ (Bitektine & Haack, 2015, p. 51). This means, information about compliance with regulations and legal decisions (Bitektine & Haack, 2015; Cashmore & Wejs, 2014; Gunningham et al., 2004; Jijelava & Vanclay, 2017; Zimmerman & Zeitz, 2002) and portrayal in the media (McCrea et al., 2020) represent vital aspects of how stakeholders determine an organisation’s SLO. Information may be incorrect or misleading, with sources such as the media selecting and framing viewpoints and facts (Dare et al., 2014), thus biasing the information and echoing particular viewpoints (Bice et al., 2017).

2.4.2 Perceptions

The information received by an individual stakeholder will be used to form two main perceptions: of the properties and behaviours of the organisation/project (link A) and of others’ judgements on the organisation (link B). A stakeholder’s perception of others’ judgements will include their perception of what the majority opinion, also known as collective judgement or validity, defined as ‘the extent to which there appears to be a general consensus within a collectivity that the entity is appropriate for its social context’ (Tost, 2011, p. 689). The individual

stakeholders' perception of the properties and behaviours of the organisation/project will include factors such as its potential impacts (e.g. Hall, 2014), which will depend on the regional and social context (Prno & Slocombe, 2014; Tarnopolskaya & Littleboy, 2015), as well as attributes of the stakeholder themselves (Measham & Zhang, 2019).

The way in which stakeholders form perceptions from available information will differ depending on their existing views and filters (Billing et al., 2021).

Stakeholders select the information they use to form perceptions and thus come to different conclusions from the same information (Billing et al., 2021). Four main attributes influence a piece of information's credibility: source (Billing et al., 2021; Bozoyan & Vogt, 2016; Saenz, 2019), reliability (Bozoyan & Vogt, 2016), valence (i.e. whether it is positive or negative) (Bozoyan & Vogt, 2016; Poortinga & Pidgeon, 2004; Tarnopolskaya & Littleboy, 2015), and fit (i.e. how well it fits in with a stakeholder's existing worldview) (Billing et al., 2021; Luke, 2017).

Stakeholders are more likely to believe information from a source close to them, or that they believe to be unbiased (Bozoyan & Vogt, 2016), for example, independent technical reports (Billing et al., 2021; Luke, 2017). Personal experience is perceived to be more reliable than 'gossip' or the repetition of other's views (Bozoyan & Vogt, 2016; Sommerfeld et al., 2007). Negative information is more salient than positive (Bozoyan & Vogt, 2016; Poortinga & Pidgeon, 2004; Tarnopolskaya & Littleboy, 2015), with negative information able to have an impact on an individual's behaviour even when from an 'untrustworthy' source (Bozoyan & Vogt, 2016). Finally, the way stakeholders perceive information will also be based on its fit with their existing views and values (Billing et al., 2021; Luke, 2017).

2.4.3 Cognitive processing

Cognitive processing is an active process whereby perceptions are used to form judgements and beliefs (Bitektine, 2011; Bitektine & Haack, 2015). Cognitive processing requires mental effort (Bitektine & Haack, 2015), which humans aim to minimise while still processing the maximum amount of information (Rosch, 1978). Different methods of cognitive processing take different amounts of effort,

with passive assimilation taking the least, then categorisation, then evaluation (Bitektine, 2011; Bitektine & Haack, 2015). As such, the methods used will depend on factors such as the stakeholder's motivation and interest, previous knowledge and available time (Bitektine, 2011; Bitektine & Haack, 2015).

2.4.3.1 Passive assimilation of collective judgement

Passive assimilation is when stakeholders simply conform to the judgement they perceive as most widely accepted (link F) (Bitektine & Haack, 2015; Tost, 2011) and represents the baseline mode of mental operations (Kahneman, 2011). As such, it will be the primary means by which individual stakeholders form judgements under conditions of organisational stability (Bitektine & Haack, 2015).

2.4.3.2 Categorisation

Categorisation is a rapid cognitive process in which information about an organisation is generalised based on grouping it with other, better-known, entities (Bitektine, 2011; Bitektine & Haack, 2015; McKnight, 1998). Judgements can then be made about an organisation's characteristics with very little information (McKnight, 1998). The grouping will be made based on perceptions of the organisation's properties or behaviours (link C). McKnight (1998) describe three forms of categorisation: unit grouping, stereotyping, and reputation categorisation.

2.4.3.2.1 Unit grouping

Unit grouping occurs when an individual puts the entity being trusted in the same group as themselves (McKnight, 1998) based on features such as shared membership of an organisation (Hurley, 2006; McKnight, 1998), common values, and traits like personality or gender (Hurley, 2006; Measham & Zhang, 2019). This creates an assumption of shared goals and values (Hurley, 2006; McKnight, 1998). This process is seen in SLO through the importance of shared experience (Thomson & Joyce, 2008), physical proximity / shared background (Billing et al., 2021), and group membership (Saenz, 2019) in determining relationships between stakeholders and organisations.

2.4.3.2.2 Stereotyping

Stereotyping is the placing of another entity into a general category, from which generalisations about their likely attributes are made (McKnight, 1998). This occurs within the SLO context through generalisations about an organisation based on their industry (Dare et al., 2014) or proxy factors such as the organisation's size (Baumber et al., 2019; Billing et al., 2021). This means an SLO can be impacted by the positive or negative legacy of past interactions between stakeholders and other organisations, even when they have no connection to the organisation or project in question (Prino & Slocombe, 2014).

2.4.3.2.3 Reputation

Reputation is the assignment of attributes to another entity based on information from external sources (McKnight, 1998) about previous behaviour (Mayer & Davis, 1995). Within SLO, the impact of reputation can be seen in reduced trust for organisations that had gained a negative reputation from previous operations (Baines & Edwards, 2018) and an increased level of trust for brands that had been present in the area for longer (Baumber et al., 2019; Koivurova et al., 2015).

Reputation is seen as a key determinant of SLO as it precedes an organisation's move to an area, thus having the ability to facilitate or block operations (Parsons et al., 2014).

2.4.3.3 Evaluation

Evaluation is the process of actively forming opinions based on perceptions of the organisation and project's properties and behaviours (link D) (Bitektine & Haack, 2015). The collective validity judgement also impacts evaluation through contributing to decisions as to the appropriate norms to evaluate the organisation against (link E) (Bitektine & Haack, 2015). This process is influenced by the context within which the decision is being made, with attributes of both stakeholders and their external context having an impact.

2.4.4 Judgements and beliefs

Through cognitive processing, stakeholders form judgements and beliefs from their perceptions (Bitektine & Haack, 2015; Cassam, 2010). Particularly important to SLO are beliefs about the organisation's trustworthiness (links G and H) and judgements of its legitimacy (links I through K) (Boutilier & Thomson, 2011; de Jong & Humphreys, 2016; Leeuwerik et al., 2021; Luke, 2017). Many factors impact an individual's judgements and beliefs, for example Gifford and Nilsson (2014) highlight 18 personal and social factors that influence pro-environmental concern, including: values; political and world views; place attachment; age; gender; religion; urban–rural differences; norms; social class; impact on self; and cultural and ethnic variations.

2.4.4.1 Legitimacy

Legitimacy was the first element of SLO to be conceptualised (Gehman et al., 2017; Joyce & Thomson, 2000) and is present in the majority of SLO conceptualisations. Suchman (1995) poses one of the most widely accepted definitions of legitimacy (Bitektine & Haack, 2015; Gehman et al., 2017), defining it as:

“a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions.” (Suchman, 1995, p. 574)

Legitimacy represents whether stakeholders deem an organisation's plans, actions, and consequences acceptable. There are multiple conceptualisations of legitimacy (Deephouse & Suchman, 2008), here I will use one based on Suchman (1995) splitting legitimacy into three categories: cognitive, based on whether the actions and presence of an organisation make sense relative to the stakeholder's worldview; pragmatic, based on whether the organisation's activities will benefit the stakeholder; and moral, based on whether the organisation's actions meet a set of moral norms.

2.4.4.1.1 Cognitive

Cognitive legitimacy is present when stakeholders see an organisation or project as necessary or inevitable (Suchman, 1995) it is impacted by categorisation (link I) and assimilation of the collective judgement (link K) (Bitektine, 2011). Where an organisation has attained cognitive legitimacy, it is more able to avoid scrutiny and distrust (Leeuwerik et al., 2021). Suchman (1995) splits cognitive legitimacy into two variants: taken-for-grantedness and comprehensibility. Taken-for-grantedness relies on organisations having become such an integral part of the fabric of society that their continued presence, and often expansion, goes unquestioned (Cashmore & Wejs, 2014; Saenz, 2019; Thomson & Boutilier, 2011). Comprehensibility is determined by the extent to which a project or organisation fits into stakeholders' existing worldviews, belief systems and daily life (Suchman, 1995). Where cultural models exist to explain an organisation and its actions, its activity will be more predictable, meaningful, and inviting for stakeholders (ibid). Where organisations are trying to gain comprehensibility, they must provide logical and easily understandable explanations of how their actions make sense and fit within society (Leeuwerik et al., 2021; Saenz, 2019; Suchman, 1995).

2.4.4.1.2 Pragmatic

Pragmatic legitimacy is self-interested (de Jong & Humphreys, 2016; Saenz, 2019; Suchman, 1995), based on expected material benefits (Baines & Edwards, 2018; Suchman, 1995) and meeting the interests of the impacted party (de Jong & Humphreys, 2016). It is promoted by transactional relationships where approval is gained through monetary compensation (Baines & Edwards, 2018; Mercer-Mapstone et al., 2017). Where stakeholders rely on organisations to meet their needs, they are less likely to expect other benefits and more likely to accept negative consequences of projects (Gunningham et al., 2004; Harvey & Bice, 2014; Moffat et al., 2016).

2.4.4.1.3 Moral

Moral legitimacy is judgement of whether an organisation is doing 'the right thing' (de Jong & Humphreys, 2016) based on an assessment of the activities compared to

moral values and norms (link J) (Leeuwerik et al., 2021). It is socio-tropic, referring to the benefit to society as a whole rather than any particular individual (Bitektine, 2011; de Jong & Humphreys, 2016; Suchman, 1995). The norms used to determine moral legitimacy will vary between cultures and situations (link E) (Bitektine & Haack, 2015; Boutilier & Thomson, 2011) as well as based on personal factors. Taking gender as an example from the list affecting judgements in section 3.4, women have been found to: be more altruistic (Dietz et al., 2002 per Measham & Zhang, 2019); hold environmental concerns more highly (Gifford & Nilsson, 2014 per Measham & Zhang, 2019); have greater moral conviction against mining (Measham & Zhang, 2019). Moral legitimacy can broadly be split into consequential legitimacy, whether the impacts are seen as acceptable and good, and procedural legitimacy, whether the organisation/project is following socially acceptable methods (Suchman, 1995).

Consequential legitimacy is determined by whether impacts are acceptable or good, representing a teleological view of legitimacy (Reeder, 2022). Within SLO, issues of moral consequential legitimacy focus on two dimensions of consequences. The first is the impacts themselves, whether this be provision of economic benefits (MacPhail et al., 2022), noise pollution (Hall, 2014), impacts on social infrastructure (Moffat et al., 2016), or the destruction of a sacred site (Thomson & Boutilier, 2011). The second focuses on whether the distribution of impacts is fair and just (Baumber et al., 2019, 2021; Dare et al., 2014; França Pimenta et al., 2021; Lesser et al., 2021; MacPhail et al., 2022; Moffat et al., 2016; Thomson & Boutilier, 2011). The use of equity (Baumber et al., 2021; Lesser et al., 2021) or equality depends on the cultural context (Thomson & Boutilier, 2011), but the concept remains. Where distributional fairness has not been considered, marginalised communities often experience the costs of a project while benefits go to relative elites (MacPhail et al., 2022).

In some cases, results may be difficult or impossible to measure directly, for example due to being in the future, ambiguous or high stochasticity (Suchman, 1995). Where this occurs, the legitimacy of actions can be assessed against how well they follow socially accepted techniques and procedures, which confer procedural legitimacy, implying the organisation is making a good faith effort to

achieve difficult to measure ends (Suchman, 1995). This focus on the means as opposed to the ends follows deontological ethics (Roby, 2018). As a concept, procedural legitimacy is included in many conceptualisations of SLO under the names procedural fairness (e.g. Baumber et al., 2021, 2019; de Jong and Humphreys, 2016, 2016; França Pimenta et al., 2021; Luke, 2017; Moffat and Zhang, 2014; Saenz, 2019) and procedural justice (Heffron et al., 2021; Luke, 2017). Perceived procedural fairness has been found to be of greater importance to stakeholders than the impacts a project has on social infrastructure (Moffat & Zhang, 2014), potentially mediated by its impact on trust (link M) (ibid).

Stakeholder inclusion in the decision-making process is a key aspect of procedural legitimacy (Leeuwerik et al., 2021). This is difficult as there is still much discussion about which stakeholders should be included (Boutilier, 2020) and, even within legitimate stakeholders, there may be competing demands (Koivurova et al., 2015) which must somehow be weighted (Moffat et al., 2016). One key issue here is recognition justice, which ‘requires that the values, worldviews, and lifeways of all peoples be acknowledged and respected’ (MacPhail et al., 2022, p. 5), particularly important when working with Indigenous peoples, who have a recognised right to self-determination (de Jong & Humphreys, 2016; Heffron et al., 2021).

How the decision is made is also important, sometimes called ‘throughput legitimacy’ (Risse & Kleine, 2007). Stakeholders must be able to meaningfully participate in the decision-making process (Hall, 2014; Heffron et al., 2021; Koivurova et al., 2015; MacPhail et al., 2022). Requiring that stakeholders have access and opportunity (Baumber et al., 2021; Heffron et al., 2021; MacPhail et al., 2022) as well as the time (Billing et al., 2021) and confidence to express their views (MacPhail et al., 2022). Alongside this, there must be institutional capacity to listen (MacPhail et al., 2022) and a lack of bias from decision makers (MacPhail et al., 2022) including not having a pre-determined outcome (Hall, 2014; Moffat et al., 2016).

Stakeholders may also assess the other information used in decision-making, often requiring information from independent technical reports to be available and utilised before accepting a project (Billing et al., 2021; Luke, 2017; Saenz, 2019).

Further, decision making requires transparency (Baumber et al., 2021; Leeuwerik et al., 2021; MacPhail et al., 2022; Prno, 2013). This requires access to and provision of information (Billing et al., 2021; Heffron et al., 2021; MacPhail et al., 2022; Prno, 2013), particularly for those impacted (MacPhail et al., 2022) including clarity about potential risks (Leeuwerik et al., 2021). This allows organisations and stakeholders to build a common future vision (Leeuwerik et al., 2021).

2.4.4.2 Trust

Trust is defined as a willingness and intention to accept vulnerability to risk or loss through the actions of another, based on positive expectations of their intentions and behaviour (Kim et al., 2004; Thomson & Joyce, 2008). In this way, trust ‘refers to the future, builds on the past and is continually reproduced in the present’ (Bachmann & Zaheer, 2013, p. 275). Violating the expectations trust is built upon, for example taking advantage of a vulnerable stakeholder (de Jong & Humphreys, 2016) can lead to ‘negative relational consequences’ (Moffat & Zhang, 2014, p. 62). Trust consists of a stakeholder judgement of their vulnerability and their beliefs that the organisation has attributes that mean they will carry through on their promises: ability, benevolence, and predictability and integrity (Mayer & Davis, 1995; McKnight, 1998). These beliefs are formed based on categorisation (link G) (Bitektine, 2011; Dare et al., 2014; Mayer & Davis, 1995; McKnight, 1998; Prno & Slocombe, 2014) and evaluation (link H) (e.g. Saenz 2019; Leeuwerik, Rozemeijer, and van Leeuwen 2021). Trust impacts stakeholders’ perceptions of fairness (Bianchi & Brockner, 2012), contact quality and the acceptability of decisions (Moffat & Zhang, 2014) (link L). Thus, having a high level of trust is likely to substantially increase an organisation’s ability to gain an SLO.

2.4.4.2.1 Vulnerability

Stakeholder’s decision to trust will be based on how vulnerable they judge themselves to be, in situations of greater vulnerability they will require a greater level of trusting beliefs in order to trust the organisation (Hurley, 2006; Mayer & Davis, 1995). Vulnerability will be based on the extent of the perceived impacts (link L), the amount of risk a stakeholder is willing to be subjected to (Hurley,

2006), and the stakeholder's power (Hurley, 2006). Power may come from stakeholder attributes, such as wealth (Boutilier, 2020), or local enabling factors and legislation (Gunningham et al., 2004; Wilson, 2016). An individual's confidence in the governance structures surrounding the project will increase their perceived power (Moffat et al., 2016; Prno, 2013; Zhang & Moffat, 2015). This is based on the regional political context, such as institutional capacity, and the stakeholder's perception of the government's ability and motivations (Lesser et al., 2021). Where stakeholders believe the government to have poor capacity (Zhang & Moffat, 2015) or a regulator to be overly 'pro-development' (Prno & Slocombe, 2014) they are less likely to trust their interests are being adequately protected (Lesser et al., 2021), and more likely to reject the project on the grounds of not being certain enough they will not be harmed (Zhang et al., 2015).

2.4.4.2.2 Ability

To carry through on their promises, organisations must have the required skills (both technical and interpersonal) and knowledge (Butler & Cantrell, 1984; Mayer & Davis, 1995). Within the SLO literature, this is generally captured as 'competence-based trust' (de Jong & Humphreys, 2016; Moffat & Zhang, 2014). This belief is specific to the organisation's expertise (Mayer & Davis, 1995). When organisations are working with stakeholders from a very different cultural background, ability will include beliefs about the organisation's understanding of local norms and cultural values (Harvey & Bice, 2014).

2.4.4.2.3 Benevolence

Benevolence is an inclination to be kind, often including putting others' needs before your own (Hurley, 2006). This belief is represented in SLO as questions about whether the organisation has 'our best interests in mind' (Thomson et al., 2010, p. 16). This may be shown through respect and consideration for welfare (Moffat & Zhang, 2014) and allowing local agency (Hall, 2014) through sharing power (Thomson & Boutilier, 2011), collaboration and providing opportunities (Thomson & Joyce, 2008) and acting on concerns, not just listening (Dare et al., 2014). This covers many of the elements of procedural legitimacy and, as such,

meeting the requirements of procedural legitimacy will contribute to trusting beliefs (link M).

2.4.4.2.4 Predictability and integrity

Predictability and integrity revolve around the belief that the trustee is adhering to an acceptable set of principles (Butcher, 2019; de Jong & Humphreys, 2016; Mayer & Davis, 1995, p. 719; Moffat & Zhang, 2014). It is no good believing in an organisation's ability and benevolence if their actions are unpredictable (Hurley, 2006). This also broadly covers the conceptualisations of credibility within SLO, in which the organisation 'is seen as following through on promises and dealing honestly with everyone' (Thomson & Boutilier, 2011, p. 1785). This requires organisations to be seen as truthful and honest (de Jong & Humphreys, 2016), keep promises (Harvey & Bice, 2014; Prno, 2013), meet expectations (Moffat & Zhang, 2014) and be transparent about their interests and motivations (Baines & Edwards, 2018; Harvey & Bice, 2014; Saenz, 2019). Organisations must also act on concerns as they arise (Dare et al., 2014), take responsibility for failures (Baumber et al., 2019), and accept fault when necessary (Heffron et al., 2021).

2.4.4.2 SLO judgement

The formation of an SLO judgement likely requires both trust (link O) and legitimacy (link N). Boutilier and Thomson (2011) argue that SLO can be gained without trust, through achieving 'economic legitimacy', which has many parallels with pragmatic legitimacy. This contradicts other accounts, which find trust to be a key component of SLO, contributing to the establishment of legitimacy (Moffat & Zhang, 2014). It is likely that different judgements and beliefs are important to different stakeholders (Lesser et al., 2021), for example, a directly impacted stakeholder is more likely to be concerned about the benefits they will receive than a distant stakeholder (Lesser et al., 2021).

A stakeholder's judgement of an organisation's SLO is not binary, and is generally conceptualised as falling into one of four levels: withdrawal, whereby an SLO has not been granted; acceptance, where stakeholders do not object to the organisation or project; approval, where stakeholders view the project favourably;

and psychological identification, where stakeholders believe that the company will always act in the community's best interests and share responsibility for a project's success (Thomson & Boutilier, 2011). It is also likely that beyond withdrawal, stakeholders can begin to accept or identify with the opposition to an organisation or project, further solidifying their disapproval (Luke, 2017).

2.4.5 Actions

Once a judgement has been formed, the stakeholder must decide whether they will externalise, potentially impacting the world around them (Bitektine & Haack, 2015; Boutilier, 2020). This decision is based on the potential consequences of expressing the judgement and will result in the judgement either being suppressed (link S) or expressed through observable substantive actions (link T) (Bitektine & Haack, 2015).

2.4.5.1 *Anticipation of consequences of expressing judgement*

Stakeholders are able to assess the likely consequences of publicly expressing their judgement (link R) (Bitektine & Haack, 2015). This will be based on the judgement itself (link P) and whether it differs from their perception of collective judgement (link Q) (Bitektine & Haack, 2015) as well as perceptions of the organisation (link R), such as the likelihood of sanctions or violent suppression of their views (Bitektine & Haack, 2015; de Jong & Humphreys, 2016). The impacts of expressing judgements need not only come from authorities but may also act through other means such as media backlash or ostracization by peers (Bitektine & Haack, 2015). These impacts will be dependent on stakeholder attributes such as power (Bitektine & Haack, 2015; Hurley, 2006). Stakeholders will also assess how likely expressing their judgement is to cause change, i.e. the positive consequences of expressing their judgement. A likely example of this found in SLO are industry phase effects, in which people are more likely to reject a project during the pre-approval phase as there is an unique and relatively low cost opportunity to say no relative to once the project is operational (McCrea et al., 2020).

2.4.5.2 Judgement suppression

Where stakeholders deem the likely negative impacts of expressing their judgement outweigh the positive impacts, their judgement will be suppressed (link S) (Bitektine & Haack, 2015). Some people are simply more risk averse and so may be less likely to risk negative consequences (Hurley, 2006). This process can lead to marginalised stakeholders feeling unable to express their judgements (Moffat et al., 2016).

2.4.5.3 Observable substantive action

Where stakeholders judge the benefits of expressing their opinion to outweigh the costs, they will externalise it through an observable substantive action (link T) (Bitektine & Haack, 2015). The methods of externalising judgements that are available to a stakeholder depend on stakeholder power, local enabling factors (Wilson, 2016) such as a political context designed for procedural empowerment (Gunningham et al., 2004), and historical context (Nyembo & Lees, 2020).

2.4.6 SLO outcome

The level of SLO depends on the SLO judgement of the individual stakeholder (link U) and the SLO judgements of other actors (link W). There is little agreement on exactly whose views matter when considering an SLO (Boutilier, 2020), however it is generally considered that some semblance of a consensus is required (Harvey & Bice, 2014). Whether or not operations go ahead is impacted by the stakeholder's actions (link U) and the actions of other stakeholders (link V) as well as external contextual factors (Boutilier, 2020; Prno & Slocombe, 2014). Depending on the nature of stakeholders' actions, they may impact the organisation directly, for example through protest (de Jong & Humphreys, 2016; Franks et al., 2014; Hanna et al., 2016; Vanclay & Hanna, 2019), or indirectly through influencing the collective judgement (Bitektine & Haack, 2015). Regional context, such as changeable economic conditions, may also impact operations irrespective of whether or not SLO has been granted (Prno & Slocombe, 2014).

The four potential SLO outcomes are shown in Figure 5. Where the SLO and operational status are coupled (Figure 5: top right and bottom left quadrants), it can be seen as generally good for the stakeholders as their demands and wishes have been met. Where there is a mismatch between SLO and operational status (Figure 5: top left and bottom right quadrants), it can be seen as negative for the stakeholders. Operations may have positive SLO with the stakeholder but be halted for some other reason, such as the actions of other stakeholders (e.g. Boutilier, 2020) or external economic pressures (e.g. Prno & Slocombe, 2014; Thomson & Boutilier, 2011). Alternatively, the stakeholder may choose not to or be unable to act on their negative SLO judgement in a way that halts operations (e.g. Syn, 2014), particularly when there are substantial power imbalances, including the threat and use of violence (de Jong & Humphreys, 2016).

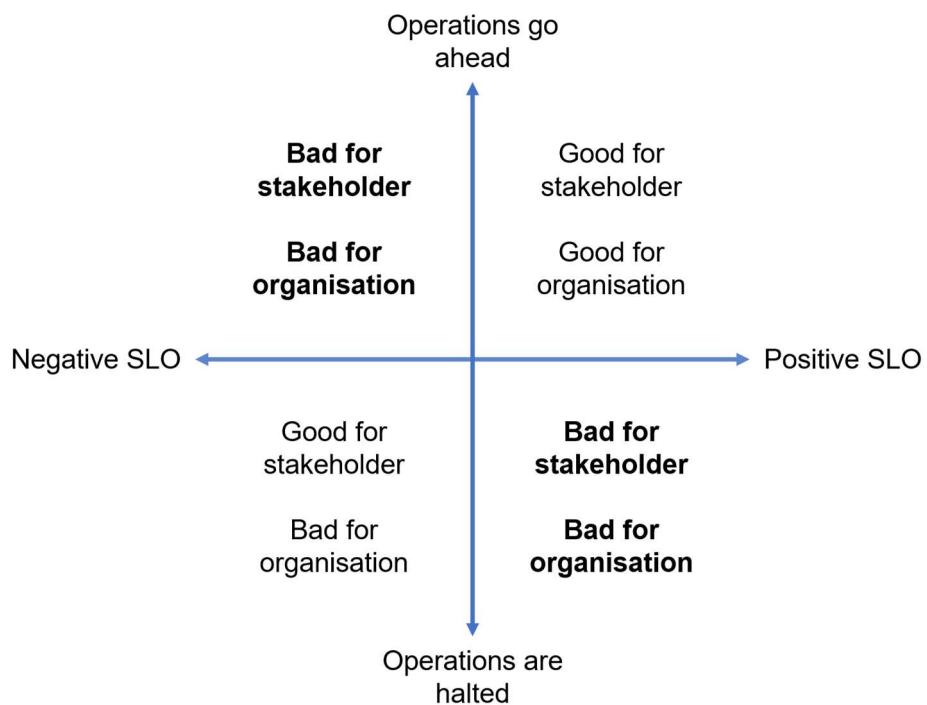


Figure 5: The four potential SLO outcomes, adapted from Prno and Slocombe (2014). SLO outcomes have two dimensions, whether SLO was granted (x-axis) and whether operations go ahead/ continue (y-axis), each quadrant represents one of the four outcomes, with the text inside showing its relevance to the community and organisation. Quadrants in which the SLO judgements and operational outcomes are uncoupled have been highlighted with bold text.

For an organisation, assuming the operations going ahead is a desirable outcome, any situation in which they are halted is negative (Figure 5, bottom two quadrants). Where operations go ahead with positive SLO, it is good for the organisation (Figure 5, top right quadrant). Where operations go ahead with negative SLO (Figure 5, top left quadrant) it is less clear, as although operations may still be profitable allowing the organisation to gain from continued operations, negative SLO can bring with it considerable costs and operational risk (Hall, 2014; Jijelava & Vanclay, 2014; Miller, 2014), so is likely to be worse for the organisation than operating with a positive SLO.

The SLO outcome will feed back into individual's decision-making process through providing new information, such as whether the organisation met expectations (Moffat & Zhang, 2014). This process allows stakeholders to continually assess the SLO of the organisation/ project (Leeuwerik et al., 2021).

2.5 Conclusions

This chapter provides an explanatory model for how individual stakeholders come to SLO judgements and how these may impact the operations of a project or organisation, building upon existing component-based (e.g. Moffat and Zhang, 2014) and process-based (e.g. Boutilier, 2020) conceptualisations of SLO. In doing so, it highlights how stakeholders can impact operations, and the importance of supporting marginalised stakeholders such that they are able to express their judgements and practice their right to self-determination. The model is not intended to quantify how SLO might be achieved through facilitating proportional allocation of the various elements included. Rather, it is designed to highlight the complexity associated with gaining SLO and to highlight the myriad of factors that organisations need to consider. It is anticipated that the importance of different elements will be context dependent meaning learning from a variety of disparate cases will be required to determine whether there are co-dependencies between factors that will assist organisations planning for the SLO. Once this has been achieved, this model will provide a means by which organisations can consider how their actions may impact SLO judgement formation, thus allowing for better project planning and outcomes.

The understanding of SLO developed within this chapter forms the framework through which acceptance is conceptualised throughout this thesis, even where it is not referred to explicitly. The importance of legitimacy and trust, and the interplay thereof, is returned to again and again, informing the questions asked in chapter four, in which I assess the general public's opinions of BNG as a policy; chapter five, in which I analyse responses to the Defra 2018-19 consultation on net gain; and chapter six, in which, I look at views of BNG in relation to a specific controversial case study, the Norwich Western Link Road. In each of these chapters, I try to build up a picture of the factors influencing people's opinions on the legitimacy of BNG and their trust in those using the policy on the ground. More proximately, this chapter reveals the importance of history in shaping the formation of opinions now: the cognitive processing required to form a judgement draws on past experience of similar situations and information on the wider population's views in order to determine the appropriateness of a course of action, in this case BNG, in the present. It is with this in mind that I spend the next chapter (Chapter Three) digging into the history and development of BNG to better understand the motivations and controversies that underly BNG, allowing an understanding of how they might inform judgements of legitimacy and trust and thus influence acceptance today.

Chapter 3 How England got to Mandatory Biodiversity Net Gain: A Timeline

3.1 Abstract

Biodiversity net gain (BNG) is a ‘net outcome’ planning policy which aims for development projects to leave biodiversity in a better state than before they started. Understanding the origins and history of existing mandatory BNG is necessary to understand the drivers and barriers that have influenced the policy to date and could inform the development and implementation of future BNG policies. Biodiversity net gain legislation was first discussed in Parliament in England through the passage of the Environment Act (2021) and became a mandatory requirement for most terrestrial and intertidal developments in February 2024. The policy uses habitat attributes as a proxy for biodiversity and represented the widest reaching net outcome policy in the world at the point of its introduction. As such, it is expected to have a significant impact on future land use decisions in England. This chapter uses a mixture of literature review and the knowledge of those involved in the early stages of this BNG policy development in England to present a timeline of the stages that have led to mandatory biodiversity net gain. In doing so, I highlight formative events and documents, as an important first step in understanding its history and understanding how this can be used to inform future biodiversity policy.

3.2 Introduction

Net outcome policies are based on a relatively simple premise: that development should aim to achieve an overall ‘no net loss’ or a ‘net gain’ in biodiversity. This extends policy beyond the mitigation hierarchy embedded in Environmental Impact Assessment (EIA) by requiring residual biodiversity losses that are not ecologically irreplaceable to be at least fully compensated for (Bull *et al.*, 2020). This, in theory, allows for continued development while maintaining a neutral or positive overall impact on biodiversity, which is essential if both socioeconomic

and ecological targets are to be met (Spaiser *et al.*, 2017; Hickel, 2019). In response to this, many governments and organisations have begun to adopt net-outcome style policies (Griffiths *et al.*, 2019; zu Ermgassen *et al.*, 2021), with sub-national policies also existing in multiple countries including the UK, Australia, the USA, Canada, and France (zu Ermgassen *et al.*, 2019).

Biodiversity Net Gain (BNG) is a net outcome planning policy which has a variety of definitions, including developments designed to make their “impact on the environment positive, delivering improvements through habitat creation or enhancement after avoiding or mitigating harm as far as possible” (Defra, 2018a, p. 13), and “development that leaves biodiversity in a better state than before. It is also an approach where developers work with local governments, wildlife groups, land owners and other stakeholders in order to support their priorities for nature conservation” (CIEEM, CIREA and IEMA, 2016, p. 2). In England, BNG policy was outlined in the Environment Act (2021) and requires developments within the scope of the policy to demonstrate they will achieve at least a 10% increase in biodiversity units from pre-development before construction can begin. The policy became mandatory on February 12th 2024 (Natural England, 2024) for the vast majority of developments falling under the Town and Country Planning Act (1990) (i.e., almost all residential, commercial, and mining related construction), and is anticipated to come into force for Nationally Significant Infrastructure Projects (NSIPs) in late 2025. Given the scope of developments for which BNG is already mandatory and the NSIPs to which it is intended soon to apply, the policy is likely to influence significant decision-making on the use of land both for those undertaking regulated developments and those interested in providing biodiversity units in England.

Documenting the development of BNG in England is an important step in understanding the drivers and constraints that have led to the policy looking as it does today, as well as how this may impact both its implementation in England and the development of future net outcome policies globally. Having a chronicle of formative events and/or policies provides the basis for other researchers, government, and industry professionals to identify the drivers and barriers that can be addressed to support the development of BNG policy elsewhere, as well as

understand how to implement future interventions and changes to improve outcomes in England as experience develops. This study, therefore, presents a timeline of the steps leading to the introduction of mandatory BNG in England, representing a first step towards properly understanding its history. In doing so, it collates knowledge of many of the interventions that have established BNG in England and provides a collection of key sources relating to it.

In developing the timeline, it is inevitable that linkages between recent events and the development of current BNG policy are easier to identify compared to those further back in time for which more inferences need to be drawn. To reflect the changing policy landscape, the timeline is divided into seven policy stages:

- o) Before 1992, most conservation policies focus on the protection of specific habitats and species, a small number of national offsetting policies arise.
- 1) From 1992 to 2006, characterised by a global recognition of the need to improve biodiversity outcomes and the inclusion of biodiversity, as opposed to specific protected habitats, in English planning policy, underpinning the future development of specific BNG policy.
- 2) From 2007 to 2014, characterised by increasing recognition of the value that biodiversity affords human beings, particularly through ecosystem services, in the UK which was reflected in a move to an ecosystems-based approach and the piloting of biodiversity offsetting in England.
- 3) From 2014 to 2016, characterised by a more bottom-up approach to the development of BNG approaches and good practice, led by industry.
- 4) From 2016 to 2019, characterised by Brexit providing the context for the revision of UK environmental protections.
- 5) From 2019 to 2021, characterised by the passage of the Environment Bill through Parliament, culminating in the adoption of the Environment Act (2021).
- 6) From 2022 to the time of writing, characterised by preparation for, and the implementation of, mandatory BNG in England.

3.3 Methods

This timeline has been produced in two stages. Initially, a broad timeline was produced using the information available in key documents and government reports on BNG found through previous research on BNG, mainly regarding the initial 2018 Defra consultation on net gain (e.g. Defra, 2018a) and related documents. These sources were then supplemented by taking a snowballing approach, following references from the identified sources and investigating events and reports mentioned in any relevant literature. The dates of any events and documents directly relevant to BNG in England were recorded in a table and a note was made of their relevance, primarily consisting of changes to legislation, mention of future dates and events, or approach to BNG that were mentioned within the documents. At this point, the timeline was split into the six sections between 1992-the present presented here, both to increase the readability of the document, and to highlight perceived shifts in approach to biodiversity leading to mandatory BNG in England. A summary paragraph was written for each section of the timeline to allow the reader to quickly determine relevance without the need to read the detail of every event. After developing this initial understanding, consultation was undertaken with academics and practitioners involved in BNG in England. This approach helped to identify additional drivers, events, and interpretations not well documented in the literature, and also additional people to consult. It was during this stage that the pre-1992 section was added in recognition of the importance of early international policies that set the context for BNG in England, and this was therefore referenced as stage 'zero', creating seven stages in total. In addition to this, international context was added to the summary paragraphs at the start of each timeline section where relevant. All people consulted have had their contribution acknowledged, either through authorship or within the acknowledgements section. Where information has been included based on the personal knowledge and experience of those involved in the policy evolution, as opposed to a more referenceable source, it has been highlighted in *italics* to make the provenance clear.

3.4 Timeline

An overview of the stages involved in the development of English BNG policy is shown in Figure 6.

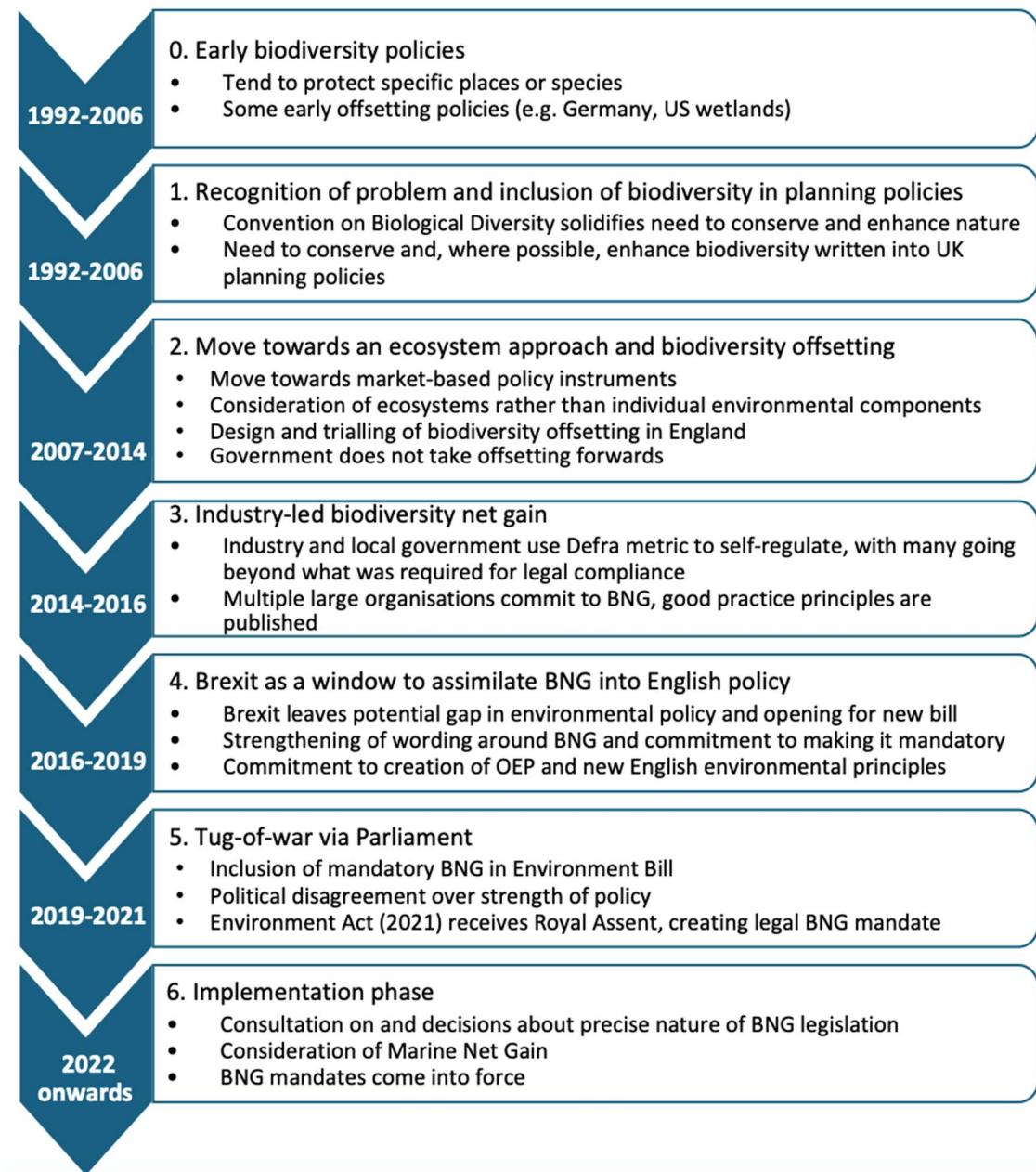


Figure 6: Summary of stages of English BNG policy development.

Stage 0 (Pre-1992): Early biodiversity policies

Early biodiversity policies focussed on specific places and landscapes, for example the Yellowstone National Park Act (1872), considered to be the first case of an area being formally protected in law with a primary purpose of preserving nature (U.S. National Park Service, 2020) and, in the UK, the protection of designated areas, initially through the National Parks and Access to the Countryside Act 1949. Later came policies designed to protect species, such as the Clean Water Act in 1972 (Hines, 2012) and Endangered Species Act in 1973 in the USA, as well as the Birds Directive in 1979 (European Commission, 2024) in the EU. Subsequently, in recognition of the extent to which development is a leading cause of biodiversity loss, multiple countries brought in offsetting-style policies; including Germany, which introduced national mandatory biodiversity offsetting in 1976 (Tucker, 2016), and the US, where no net loss was suggested as a goal for US wetlands policy at the National Wetlands Policy Forum in 1987 and adopted into policy in 1989 (Heimlich *et al.*, 1998).

Stage 1 (1992 to 2006): Biodiversity enters planning policy

During this period, there is increasing concern about the implications of continued biodiversity loss and the need to halt and, where possible, reverse this. Following the adoption of the Convention on Biological Diversity in 1992 (United Nations, 1992), the UK adopted a biodiversity action plan and considered using the planning system to minimise harm caused by development and, where possible, use it to enhance biodiversity. Elsewhere, no net loss continued to be adopted as a biodiversity policy, for example, in the states of New South Wales, Victoria and Western Australia in Australia (ten Kate, Bishop and Bayon, 2004 Box 12). Also during this time, interest in offsetting within the private sector increased (e.g. ten Kate, Bishop and Bayon, 2004) leading to the founding and first meeting of the Business and Biodiversity Offsets Programme in 2004 (BBOP, 2018). Key events in England during this period are shown in Table 2.

Table 2: Events of timeline Stage 1 (1992 to 2006), in which biodiversity enters UK planning policy, and their relevance to BNG.

Year	Month	Event	Relevance to BNG
1992	May	Convention on Biological Diversity (United Nations, 1992)	<ul style="list-style-type: none"> • Recognised need for nations to conserve and enhance biodiversity • Identified need for global scientific ecosystem assessment • UK sign up, committing to conserve and protect existing biological diversity, and to enhance it wherever possible, including drawing up a national biodiversity action plan
1994	January	UK Biodiversity Action Plan published (Department of the Environment, 1994)	<ul style="list-style-type: none"> • Required by Convention on Biological Diversity (1992) • Recognition of need “to ensure the conservation and, where possible, the enhancement of biodiversity within the UK” (p. 3) • Set priority species and habitats
1995	July	The Environment Act 1995 (Environment Act, 1995)	<ul style="list-style-type: none"> • Created the Environment Agency and some provisions for “the conservation of natural resources and the conservation or enhancement of the environment” (p.1)
2000	April	UN announce The Millennium Ecosystem Assessment (Annan, 2000)	<ul style="list-style-type: none"> • Announced by UN Secretary-General Kofi A. Annan • Intended to provide scientific evidence for future policy

Table 2: Events of Stage 1 (1992 to 2006), in which biodiversity enters UK planning policy, and their relevance to BNG.

Year	Month	Event	Relevance to BNG
2000	May	COP-5 adopts the ecosystem approach and defines principles for its use (United Nations, 2000)	<ul style="list-style-type: none"> Defines the ecosystem approach as “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.” (Annex A) Makes a call for governments and organisations to use the ecosystem approach as appropriate Makes it clear that the “ecosystem approach does not preclude other management and conservation approaches” (Annex A) Provides principles for the use of the ecosystem approach (Annex B)
2000	November	Countryside and Rights of Way Act (Countryside and Rights of Way Act, 2000)	<ul style="list-style-type: none"> Required the Minister of the Crown, Government departments, and the National Assembly for Wales “to have regard ... to the purpose of conserving biological diversity in accordance with the Convention [on Biological Diversity of 1992]” (Part III, Section 74.1) Created duty to publish lists of habitats and species of principle importance and take and promote “reasonably practicable” steps “to further the conservation of the living organisms and types of habitat included in [said lists]” (Part III, Section 74.3)

Table 2: Events of Stage 1 (1992 to 2006), in which biodiversity enters UK planning policy, and their relevance to BNG.

Year	Month	Event	Relevance to BNG
2002	October	Defra publish “Working with the grain of nature” a new biodiversity strategy for England (Defra, 2002)	<ul style="list-style-type: none"> Set the aim to “ensure that construction, planning, development and regeneration have minimal adverse impacts on biodiversity and enhance it where possible” (p. 53) Suggests action towards “[p]lanning policies and development decisions that recognise the need to conserve and enhance biodiversity.” (p. 57)
2004	December	IEEM Fellows lecture putting forwards mitigation banking in England (Hill, 2004)	<ul style="list-style-type: none"> Pushed for mitigation banking to be investigated as an approach for conservation in the UK Suggested environmental stewardship schemes could be linked with mitigation banking, “enabling greater biodiversity gains” (p. 6)
2005	January	Planning Policy Statement 1: Delivering Sustainable Development (Office of the Deputy Prime Minister, 2005a)	<ul style="list-style-type: none"> Set out that planning authorities “should seek to enhance the environment as part of development proposals” (para. 19) Included the “polluter pays” principle (para. 19) setting out that organisations should pay to remediate their environmental externalities
	March	UN Millennium Ecosystem Assessment (MEA) published (Millennium Ecosystem Assessment, 2005)	<ul style="list-style-type: none"> Influenced thinking in the UK, leading to the UK NEA (Waylen and Young, 2014)

Table 2: Events of Stage 1 (1992 to 2006), in which biodiversity enters UK planning policy, and their relevance to BNG.

Year	Month	Event	Relevance to BNG
	August	Planning Policy Statement 9: Biodiversity and Geological Conservation (Office of the Deputy Prime Minister, 2005b)	<ul style="list-style-type: none"> Included ensuring that biodiversity is conserved and enhanced as “an integral part” of development as a key Government objective for planning (Page 2) Reiterated that “Plan policies and planning decisions should aim to maintain, and enhance, restore or add to biodiversity”
2006	March	Natural Environment and Rural Communities Act (Natural Environment and Rural Communities Act 2006)	<ul style="list-style-type: none"> Creates more general duty to conserve biodiversity (section 40), updating that previously set out in the (<i>Countryside and Rights of Way Act, 2000</i>), to require that “[e]very public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity” (p. 14)
	September	The Environment Bank Ltd is incorporated (Companies House, 2024)	<ul style="list-style-type: none"> <i>Established to lobby for, and undertake, biodiversity offsetting projects.</i>

Stage 2 (2007-2014): Nature as offset-able ecosystems

This period saw a move towards treating biodiversity as ecosystems as opposed to its individual parts, including the assessment of UK and English ecosystems, the state they are in, and the economic value they confer. Throughout this period, *there was substantial internal lobbying for biodiversity offsetting within Natural England* and the government commissions significant amounts of research on ecosystems, biodiversity offsetting and biodiversity markets. Biodiversity offsetting is scoped and trialled as a policy option in England to see if it could more efficiently and effectively deliver existing biodiversity planning and consent processes, accompanied by a political push for market-based conservation methods. The UK Government introduce a no net loss objective and net gain aim. During this period, considerable information exchange occurs between the UK policy makers and other countries with established offsetting policies through conferences *and meetings*. A considerable media push-back occurs against offsetting as a policy. Elsewhere, other countries continue to adopt net outcome policies, notably in Europe, with the European Parliament calling for No Net Loss regulation using BBOP standards in 2012 (BBOP, 2018); the European Commission consultation on no net loss in 2014 (European Commission, 2014); and France introducing NNL into guidance developed in 2012/13, and into law in 2016 (Vaissière *et al.*, 2018). Key events in England during this period are shown in Table 3.

Table 3: Events of timeline Stage 2 (2007 to 2014), in which nature is increasingly treated as offset-able ecosystems.

Year	Month	Event	Relevance to BNG
2007	January	House of Commons Environmental Audit Committee review the MEA (Environmental Audit Committee, 2007b)	<ul style="list-style-type: none"> • Reiterates need for companies to internalise their environmental impact • Recommend that the government assess UK ecosystems to identify and develop effective policy responses (para. 30)
	June	UK Species and Habitat Review concludes (Biodiversity Reporting and Information Group (BRIG), 2007)	<ul style="list-style-type: none"> • Updated UK BAP priority species and habitats
	July	Government response to Environmental Audit Committee's review of MEA (Environmental Audit Committee, 2007a)	<ul style="list-style-type: none"> • Early mention of the need for metrics for ecosystem services to aid in internalising business externalities (p. 6) • References the upcoming Defra Ecosystems Approach Action Plan as a solution to better valuation of ecosystem services (p. 13) • References that work on “status and trends in England’s terrestrial ecosystems, and the goods and services they provide” (p. 17) is being done

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2007	October	Defra and UK Biodiversity Partnership publish 'Conserving Biodiversity – The UK Approach (Defra and UK Biodiversity Partnership, 2007)	<ul style="list-style-type: none"> Designed to provide a strategic framework for conserving biodiversity in the UK in the light of changing pressures and increasing devolution Pushes the importance of the ecosystem approach as decided in COP-5 (United Nations, 2000) Discusses the importance of targeting action to priority species and habitats and embedding “proper consideration of biodiversity and ecosystem services into all relevant sectors of policy and decision-making” (p.10)
	December	Defra publish Ecosystems Approach Action Plan (Defra, 2007)	<ul style="list-style-type: none"> Cohesive ecosystems-based approach rather than considering environmental elements in separate policies Identified a need to explore new policy options for ecosystem conservation, possibly including the creation of a market in biodiversity or new incentives for biodiversity “such as biodiversity offsets”, particularly to reduce the loss of non-designated sites and features (Treweek, 2009)

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offset-able ecosystems.

Year	Month	Event	Relevance to BNG
2008	<i>Early</i>	Results of Defra-commissioned scoping study for UK MEA-style ecosystem assessment published (Haines-Young <i>et al.</i>, 2008)	<ul style="list-style-type: none"> Suggests that it would be possible and would provide benefits but may be too expensive if not mainly built based on existing research.
		Defra commission a scoping study for the design and use of biodiversity offsets in an English context (Treweek, 2009)	<ul style="list-style-type: none"> Sought to use offsetting fulfil duties under the Countryside and Rights of Way Act (2000), the Natural Environment and Rural Communities Act (2006) and associated planning policy Identifies how offsets could be set up in the UK and how this would fit with current legislation
2009	<i>Unknown</i>	BBOP Principles, Handbooks, Resource Papers, Glossary and Case Studies published (e.g. BBOP, 2009b, 2009a)	<ul style="list-style-type: none"> Marked completion of Phase I of BBOP's work Provided an international best practice for biodiversity offsetting Suggested the use of different metrics (inc. area based; area x quality; species density and occupancy) depending on context Principles state that projects using offsets should follow the mitigation hierarchy, recognise that some biodiversity is irreplaceable, ensure offsets result in both additional conservation outcomes that are secured for at least the lifetime of the project and equitable social outcomes based on stakeholder engagement, and both science and traditional knowledge

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2009	April	Results of English offsetting scoping study published (Treweek, 2009)	<ul style="list-style-type: none"> • Found that “biodiversity offsets are unlikely to be implemented to any great extent under current EU law and associated regulations” (p. 3) • Suggested more consideration of whether new regulation would be required to ensure a regular and consistent ‘no net loss of biodiversity’ requirement for development and systems for trading biodiversity credits • Suggested need for a series of pilot projects • Put forward a habitat-based metric calculating units as <i>area (ha) x distinctiveness x condition</i>, later used in the 2012 Defra offsetting pilots
	mid-year	UK National Ecosystem Assessment commences as part of the Living With Environmental Change (LWEC) initiative (UNEP WCMC, 2009)	<ul style="list-style-type: none"> • Was expected and initiated to produce evidence that could be used to inform future policy (Waylen and Young, 2014)
	Sept	Lawton Review commissioned (Lawton et al., 2010, p. ii)	<ul style="list-style-type: none"> • Commissioned by Hilary Benn, the then Secretary of State in the Department for Environment, Food and Rural Affairs, to review whether England’s wildlife sites were capable of adapting to climate change and other land uses

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offset-able ecosystems.

Year	Month	Event	Relevance to BNG
2010	January	Possible methods for measuring biodiversity losses and gains for use in the UK published (Treweek, Butcher and Temple, 2010)	<ul style="list-style-type: none"> Requires an ecosystem approach to value areas as a whole rather than their individual components Recommended a minimum of 1:1 ratio of area of compensation to area of habitat lost Recognised that some important attributes would not be captured by a habitat-based system
	April	Conservative party release election manifesto (Conservative Party, 2010)	<ul style="list-style-type: none"> Discusses a move away from “rules and regulations to impose a centralised worldview” to “new incentives and market signals” (p. 89) Includes proposal for the increasing the “market for green goods and services” (p. 89) and “a new system of conservation credits to protect habitats” (p. 96)
	May	UK general election results in a Conservative-Liberal Democrat coalition (Rhodes, McGuinness and Cracknell, 2011)	<ul style="list-style-type: none"> Conservatives win the most seats but not a parliamentary majority Allows Conservatives to begin enacting their proposed environmental policies
	July	Defra publish discussion document in advance of 2011 White Paper (Defra, 2010a)	<ul style="list-style-type: none"> Suggests biodiversity offsetting to increase the role of ‘Big Society’, as opposed to ‘Big Government’, in ensuring sustainable natural resource use

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2010	September	Lawton review published (Lawton <i>et al.</i>, 2010)	<ul style="list-style-type: none"> • Suggested four main principles for improvement: bigger, better, more, and joined up • Suggested the need for considerable leadership from government • Set out principles for effective biodiversity offsetting
	December	Defra post discussion materials about biodiversity offsetting on website (Defra, 2010b)	<ul style="list-style-type: none"> • Intended to feed into the 2011 Natural Environment White Paper • Suggested using Section 106 (dealing with planning obligations in the Town and Country Planning Act 1990) payments for offsetting • Summary of responses, published in July 2011 (Defra, 2011a) showed respondents were broadly positive • Concerns about the potential for offsetting to undermine the mitigation hierarchy, increased burden including expertise requirements in local authorities, and implications of maintaining offsets “in perpetuity”
2011	January	Biodiversity Offsetting POSTnote published (POST, 2011)	<ul style="list-style-type: none"> • Provided a summary of biodiversity offsetting for members of Parliament
	May	Defra publish 2011-2015 business plan (Defra, 2011b)	<ul style="list-style-type: none"> • Had “Assess the scope for actions to offset the impact of development on biodiversity” as an action point

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2011	June	UK National Ecosystem Assessment published (UK National Ecosystem Assessment, 2011)	<ul style="list-style-type: none"> Identified land use change as a major factor in ecosystem declines and suggested offsetting as one part of the solution (UK National Ecosystem Assessment, 2011) Provided much of the evidence for the government white paper (Watson, 2012) however, this was due to contact between departments, not the original intention (Waylen and Young, 2014)
		UK Government White Paper “The Natural Choice: securing the value of nature” (Defra, 2011c)	<ul style="list-style-type: none"> Promoted the importance of markets for ecosystem services (p. 4) Set a no net loss objective with plan to move to net gain. Emphasised the role of planning in securing a sustainable future, but lamented the costly and bureaucratic nature of existing systems (para. 2.33-2.34) Discussed the upcoming National Planning Policy Framework (NPPF) as a solution to planning issues, including a “new presumption in favour of sustainable development” (para. 2.37) Introduced biodiversity offsetting as a means of allowing development to achieve no net loss, based on the principles set out in the Lawton Review (para. 2.38-2.40) Introduced the plan for a two-year offsetting pilot testing a new voluntary approach in certain local authorities, running from Spring 2012 (para. 2.41)

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2011	June	Continued UK Government White Paper “The Natural Choice: securing the value of nature” (Defra, 2011c)	<ul style="list-style-type: none"> Committed to setting up a business-led Ecosystem Markets Task Force to report “to review the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect nature’s services” (Annex I: para. 44) reporting back in 2013
2012	Jan-June	BBOP Standard, Guidelines, and more Resource Papers published (BBOP, 2009b, 2012b, 2012a, 2012c)	<ul style="list-style-type: none"> The result of BBOP’s Phase II work. Included a published standard for biodiversity offsets and new guidance for measuring losses and gains
	March	National Planning Policy Framework (NPPF) published (Department for Communities and Local Government, 2012)	<ul style="list-style-type: none"> Substantially simplified the planning process, replacing 44 pieces of previous planning legislation. First use of “net gain” with respect to biodiversity in English planning policy, stating that “[t]he planning system should contribute to and enhance the natural and local environment by ... minimising impacts on biodiversity and providing net gains in biodiversity where possible” (Department for Communities and Local Government, 2012, para. 109) Provided a legislative justification for local councils to aim for net gain

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offset-able ecosystems.

Year	Month	Event	Relevance to BNG
2012	April	Two-year offsetting pilots begin (Defra and Natural England, 2012)	<ul style="list-style-type: none"> • Aimed to assess whether biodiversity offsets helped to streamline planning process and deliver greater benefits for biodiversity (Baker <i>et al.</i>, 2014) • Included six pilot local planning authorities: Doncaster, Devon, Essex, Greater Norwich, Nottinghamshire or Warwickshire with Coventry and Solihull • Guidance for using the habitat metric put forward in Treweek, Butcher and Temple (2010) (p. 5-7), did not include a minimum compensation, <i>although the pilots were expressly designed not to test the metric</i> • First English guidance for offset requirements (broadly like-for-like or better; p. 8) • Emphasised importance of the mitigation hierarchy (p. 4) • Allowed organisations to provide their own offsets or purchase them from a provider
	Onwards	Mixed response to offsets in media	<ul style="list-style-type: none"> • Some consider offsetting as a "licence to destroy" (e.g. Monbiot, 2012)
	July	UK BAP succeeded by UK Post-2010 Biodiversity Framework (JNCC and Defra, 2012)	<ul style="list-style-type: none"> • Introduces targets that "[b]y 2020, at the latest, biodiversity values have been integrated into national and local development" and "positive incentives for the conservation and sustainable use of biodiversity are developed and applied" (p. 11)

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2013	Unknown	The Thameslink Programme voluntarily set target to achieve BNG for the second phase of the Thameslink upgrade (Defra, 2013a)	<ul style="list-style-type: none"> Very early adopter of BNG
	February	POSTnote on potential solutions for biodiversity and planning decisions published (POST, 2013)	<ul style="list-style-type: none"> Summarises potential policies that might improve the planning system to address biodiversity loss Discusses biodiversity offsetting for compensation
	March	Final Report of the Ecosystem Markets Task Force published (Ecosystem Markets Task Force, 2013)	<ul style="list-style-type: none"> Includes mandating biodiversity offsetting as the number one priority recommendation for the government. Sees biodiversity offsetting as a way to save developers time and money, revolutionise conservation in England, and stimulate the competitive growth of businesses.
	May	Defra summit on biodiversity offsetting (British Ecological Society, 2013)	<ul style="list-style-type: none"> Called by Owen Paterson, the Secretary of State for the Environment, Food and Rural Affairs Patterson discussed his trips to understand the Australian systems and reported general cabinet support for biodiversity offsetting.

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2013	September	<p>Government responds to Ecosystem Markets Task Force report (Defra, 2013b)</p>	<ul style="list-style-type: none"> Announce green paper consultation on biodiversity offsetting. Emphasise that “an offsetting system must deliver benefits for development” (p. 7) and suggest a permissive approach “giving developers the choice to use biodiversity offsetting where it would enable them to meet existing requirements more efficiently than happens currently” (p. 7) Stated that “Following the Green Paper consultation the Government will develop its detailed proposals for using biodiversity offsetting and plans to set these out by the end of 2013” (p. 7)
2013	September	<p>Meeting of experts promoting species considerations for biodiversity offsets in England (Howard and Gent, 2013)</p>	<ul style="list-style-type: none"> Highlighted "need to designate a set of approaches to offsetting for impacts on each species requiring special consideration in biodiversity offsets" (p. 1) Came up with recommendations as to how species should be considered going forwards, including coming up with a list of priority species and further evidence collection as to habitat suitability
	Autumn	<p>National Grid state voluntary aim to create biodiversity gain (National Grid, 2013)</p>	<ul style="list-style-type: none"> “National Grid aims to create biodiversity gains by using its land to create a natural grid of better and bigger habitats” (p. 6)

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2013	Sept-Nov	Defra Green Paper consultation on introducing biodiversity offsetting in England (Defra, 2013a)	<ul style="list-style-type: none"> Presented offsetting as a means to tackle the “twin challenges of growing its economy and improving its natural environment” (both p. 1) as well as reducing uncertainty and cost in development and planning Stated the Government would only bring in an offsetting system if it would make the planning system related to biodiversity “quicker, cheaper and more certain for developers”; “[a]chieve net gain for biodiversity” by ensuring no net reduction in number of units “and seeking to locate offsets in a way that enhances ecological networks (achieving “net gain”); and “[a]void additional costs to businesses” (all p. 8) Results published in February 2016 (Defra, 2016) found a slim majority (53%) of respondents wanted offsetting The majority of respondents from the public opposed offsetting, either in principle or due to a lack of confidence in the proposed system
	Sept-Nov	Consultation triggers new wave of negative press (e.g. Carrington, 2013; Howarth, 2013)	<ul style="list-style-type: none"> Continue to present offsetting as 'a licence to trash nature'

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2013	Oct-Nov	Environmental Audit Committee biodiversity offsetting enquiry (Environmental Audit Committee, 2013)	<ul style="list-style-type: none"> Launched to look into the Government consultation on biodiversity offsetting in England Reported that offsetting should only be brought in if, after the pilots had been completed and independently assessed, offsetting was found to bring benefits Considered the metric too simplistic and that a “proper metric needs to reflect the full complexity of habitats, including particular species and ‘ecosystem networks’, and recognise the special status of ancient woodlands and sites of special scientific interest” (p. 3) Emphasised the need to follow the mitigation hierarchy and for offsets to be “near enough to the local development that local people can still enjoy [them]” (p. 3) Stated if biodiversity offsetting were to be brought in, it would need to be mandatory

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2013	Nov	HS2 publish biodiversity metric and set route-wide NNL target (Department for Transport and High Speed Two (HS2) Limited, 2013)	<ul style="list-style-type: none"> • Broadly similar to Defra metric but first included irreplaceable habitats (which were later removed) and had shorter time to target condition (Natural England, 2016c)
2014	March	Report to Defra on lessons learnt from biodiversity offsetting markets in other countries (Duke and ten Kate, 2014)	<ul style="list-style-type: none"> • Designed to gather evidence from the US and Australia (existing offsetting markets) • Found benefits for developers including efficiency, unblocking developments and reduction in liabilities. • Found market design greatly impacts cost and availability of units. • Found on-site compensation delivers poor conservation outcomes. • Found considerable economic benefit from market and speeding up development.

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2014	April	Offsetting pilots end (Baker <i>et al.</i>, 2014)	<ul style="list-style-type: none"> Involved stakeholders generally felt that Defra metric v1 was a consistent, transparent and simple method to measure biodiversity changes that accounted for a wider range of impacts than prior practice Some stakeholders had concerns that the metric omitted certain ecological aspects, was more intensive than current practice, and misvalued certain habitat types All but one of the pilots felt that a voluntary system was insufficient to support widespread biodiversity offsetting In some cases, offsetting was presented by developers as a means to compensate for, instead of avoid, damage to potentially undermining the mitigation hierarchy Many developers challenged the increased compensation requirement identified by the metric Found that the current system was not meeting no-net-loss as measured by the metric Concluded that offsetting had the potential to provide improved biodiversity outcomes if additional resources were provided to fund ecological expertise in local authorities but that it would result in increased costs to developers and the benefits in terms of streamlining the planning process were, at best, marginal Publication of metric allowed other organisations to take it on and use it

Table 3: Events of Stage 2 (2007 to 2014), in which nature is increasingly treated as offsettable ecosystems.

Year	Month	Event	Relevance to BNG
2014	June	<p>'To No Net Loss of Biodiversity and Beyond' conference co-hosted by Forest Trends, BBOP, ZSL and Defra in London (Forest Trends <i>et al.</i>, 2014)</p>	<ul style="list-style-type: none"> • Included 280 individuals from 32 countries • Hosted by Forest Trends, the Business and Biodiversity Offsets Programme (BBOP), the UK Department for Environment, Food and Rural Affairs (Defra), and the Zoological Society of London (ZSL) • Identified need for clear policy for no net loss or BNG to become a reality as well as needs to build capacity, strengthen protection, ensure monitoring and enforcement, and consistently apply mitigation hierarchy
		<p>2nd Forum of Natural Commons held in Regent's Park Hub, London (Verpoest, 2014)</p>	<ul style="list-style-type: none"> • Held to protest No Net Loss conference. • Panels on the narrative behind valuing nature and the potential impact of biodiversity offsetting on communities
	July	<p>Owen Paterson, Environmental Secretary and major proponent of offsetting, loses position in cabinet reshuffle (Phipps, 2014)</p>	<ul style="list-style-type: none"> • <i>Potentially related to government decision not to take offsetting forward</i>

Stage 3 (2014-2016): Industry led BNG

The Government do not take offsetting forward, *anecdotally due to the negative press and reaction to pilot projects combined with the removal of Owen Paterson, a major proponent of offsetting as an approach, from cabinet. Meanwhile, many of the local planning authorities involved in the offsetting pilots continue with offsetting.* Industry takes the tools published for the offsetting pilots to set and demonstrate progress towards voluntary targets of NNL and BNG that go beyond compliance *and help to shift attitudes in industry to move from ecology being an issue of risks to a measurable sustainability opportunity.* This, *combined with individuals within organisations pushing for better biodiversity outcomes,* leads to multiple projects piloting a BNG approach and a multiple industry and governmental organisations committing to BNG. The good practice guidelines are put together *building on the international principles published by BBOP* and published in response to the need to bring some standardisation to practice and to set out good practice. Local government and industry began calling for mandatory BNG to further standardise practice and provide a 'level playing field'. Key events in England during this period are shown in Table 4.

Table 4: Events of timeline Stage 3 (2014 to 2016), in which progress towards BNG is led by industry.

Year	Month	Event	Relevance to BNG
2014	Unknown	Transport for London publish framework (Butterworth <i>et al.</i>, 2019, p. 30)	<ul style="list-style-type: none"> Includes aim to “protect, manage and enhance the natural environment within our land holding” (Butterworth <i>et al.</i>, 2019, p. 30)
2015	January	Warwick District submit local plan including BNG aim (Warwick District Council, 2015)	<ul style="list-style-type: none"> States that “the Council seeks to protect the natural environment and strives for net gains in biodiversity” (p. 154) Plan adopted in 2017 (Council, 2024) Approach to BNG and offsetting included the development and use of a ‘locally derived Defra metric’ (Lowe, 2019)
	March	Department for Transport publish Road Investment Strategy: for the 2015/16 –2019/20 Road Period (Department for Transport, 2015)	<ul style="list-style-type: none"> Includes aspiration for NNL by 2020 and BNG by 2040
	June	Highways England publish biodiversity plan (Highways England, 2015)	<ul style="list-style-type: none"> Reiterates plan for roads to achieve BNG by 2040 Includes commitment to creating or adopting a biodiversity metric by December 2017

Table 4: Events of Stage 3 (2014 to 2016), in which progress towards BNG is led by industry.

Year	Month	Event	Relevance to BNG
2015	October	Barratt Homes include habitat enhancement in operational principles (Barratt Developments plc, 2015)	<ul style="list-style-type: none"> State that they 'seek to enhance habitats, biodiversity and local environments across all of our developments.' Early steps towards BNG in housing sector
	(pre-)November	Network Rail Infrastructure pilot Projects make commitment for net positive for biodiversity to be business-as-usual by March 2019 (Darbi, 2015; IEMA, 2015)	<ul style="list-style-type: none"> A series of webinars discuss Network Rail Infrastructure Projects' commitment to achieving a "measurable net positive contribution towards biodiversity in the UK" (Darbi, 2015) And "plans for Net Positive to become business-as-usual by March 2019" (IEMA, 2015)
	December	Lichfield District Council introduce BNG aim (Lichfield District Council, 2015)	<ul style="list-style-type: none"> "Core Policy 13: Our Natural Resources is the over arching policy which... seeks to deliver a net gain for biodiversity where impacts arise from development proposals" (p. 31)

Table 4: Events of Stage 3 (2014 to 2016), in which progress towards BNG is led by industry.

Year	Month	Event	Relevance to BNG
2016	February	Defra publish summary of responses to 2013 Green paper biodiversity offsetting consultation (Defra, 2016)	<ul style="list-style-type: none"> Next steps section does not discuss taking offsetting forwards, instead stating they will “continue to work ... to further our shared understanding of how best to compensate for biodiversity loss when it cannot first be avoided or mitigated” (p. 37)
	May	Lichfield District Council introduce BNG requirement (Lichfield District Council, 2016a, 2016b)	<ul style="list-style-type: none"> “Developments which take into account the role and value of biodiversity ... and must deliver a net gain for Biodiversity.” (p. 6)
	October	Industry increasingly adopt BNG	<ul style="list-style-type: none"> WSP publish report on BNG and its role in infrastructure (WSP and Parsons Brinckerhoff, 2016), predicting BNG’s inclusion in planning policy and discussing the usefulness of creating a consistent understanding to create a level playing field for developers. Crossrail 2 introduce BNG aim. Barratt Homes introduce a net positive biodiversity target (Barratt Developments plc, 2016).

Table 4: Events of Stage 3 (2014 to 2016), in which progress towards BNG is led by industry.

Year	Month	Event	Relevance to BNG
2016	November	<p>“Enhancing Natural Capital and Delivering Biodiversity Gain Through Planning and Development” Conference (Natural England, 2016a, 2016b)</p>	<ul style="list-style-type: none"> Convened by Natural England and hosted by National Rail Considerable discussion with many partner organisations on moving from offsetting to net gain and how to deliver net positive <i>Results in Natural England's renewed involvement in what became known as BNG and the organisational commitment to then try to take forward work on standards and metric updates</i>
	December	<p>Biodiversity Net Gain: Good Practice Principles for Development published (CIEEM, CIREA and IEMA, 2016)</p>	<ul style="list-style-type: none"> Industry led principles for good practice BNG that contributes to strategic priorities and sustainable development adapted from the BBOP principles. Gave industry criteria to show that projects have followed good practice. Included a clear definition of BNG as “development that leaves biodiversity in a better state than before. It is also an approach where developers work with local governments, wildlife groups, landowners and other stakeholders in order to support their priorities for nature conservation” (p. 2)

Stage 4 (2016-2019): Brexit policy shock

The UK votes to leave the EU, meaning the 80% of UK environmental legislation derived from the EU is up for debate (Friends of the Earth, 2021) *creating a window for substantial environmental policy change* and catalysing the passage of the Environment Bill through Parliament. *BNG is proposed for inclusion in the Environment Bill and is perceived by some as a means of financing manifesto commitments to environmental improvement in the face of austerity and fiscal restraint.* The government consults on making BNG mandatory, leading to a commitment to include it in the Bill. Requirements for environmental legislation post-Brexit are negotiated between the House of Commons and House of Lords. Independently of Brexit, the UK government moves towards biodiversity net gain consideration, including the first policy mention of “measurable” BNG. Net outcomes continue to increase in popularity within industry and, by 2018, some 60 companies worldwide were estimated to have public, company-wide commitments or aspirations for No Net Loss of biodiversity or similar (BBOP 2018b). Key events in England during this period are shown in Table 5.

Table 5: Events of timeline Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2016	June	UK referendum results in 3.8% winning margin for leave (Uberoi, 2016)	<ul style="list-style-type: none"> • 80% of the UK's laws at the time derive from the EU (Friends of the Earth, 2021), potential for all of these to be changed • Societal will for stronger environmental legislation: in a survey, 83% of people surveyed said Britain's new environmental laws after Brexit should be at least as good (37%) or even better (46%) than those from the EU (Carrington, 2016)
2017	March	European Union (Notification of Withdrawal) receives Royal Assent (European Union (Notification of Withdrawal) Act 2017 (c. 9), 2017)	<ul style="list-style-type: none"> • Set the legislative process of Brexit in motion
	May	Berkeley Group commit to achieve biodiversity net gain on new developments (Berkely Group, 2017)	<ul style="list-style-type: none"> • The “first developer [in England] to commit to achieving a net biodiversity gain on every new site” (p. 9)
2017	July	First reading of the European Union (Withdrawal) Bill (Department for Exiting the European Union, 2018)	<ul style="list-style-type: none"> • First public version of the legal requirements for the UK after leaving the EU • Little discussion of environmental issues (HM Parliament, 2018)

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2018	August	Mayor of London publishes draft London Environmental Strategy (Mayor of London, 2017)	<ul style="list-style-type: none"> Includes policy 5.2.1 to “[p]rotect a core network of nature conservation sites and ensure a net gain in biodiversity” (p. 161)
	Unknown	BBOP publish Roadmaps for Government and Business, Resource Papers, and Overview with Call to Action (BBOP, 2018)	<ul style="list-style-type: none"> Marked the conclusion of BBOP’s activities. Provided clear and actionable roadmap and guidance for governments and businesses wanting to go forwards with offsetting. Aimed at following the mitigation hierarchy to achieve at least No Net Loss and preferably a Net Gain.
	January	UK Government publish 25 Year Environmental Plan “A Green Future: Our 25 Year Plan to Improve the Environment” (HM Government, 2018)	<ul style="list-style-type: none"> Commits to ambitious development targets and to “embed a ‘net environmental gain’ principle for development ... enabl[ing] housing development without increasing overall burdens on developers.” (p. 33) <i>BNG had been identified by Michael Gove, the Secretary of State for Environment, Food and Rural Affairs, as an opportunity to improve nature development outcomes, providing important political weight to the policy</i> Committed to “[m]aking sure that existing requirements for net gain for biodiversity in national planning policy are strengthened, including consulting on whether they should be mandated alongside any exemptions that may be necessary” (p. 34)

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2018	Feb-May	European Union (Withdrawal) Act debated in the House of Lords (Maer, 2018a)	<ul style="list-style-type: none"> Non-government amendment requiring the protection of EU environmental principles and standards, including equivalent independent oversight, added on the third reading
	May-Aug	Defra launch Consultation on Environmental Principles and Governance after EU Exit (Defra, 2018b)	<ul style="list-style-type: none"> Set out that a statutory policy statement on principles and accountability, including the creation of a new body to hold government to account, would be created through an Environmental Principles and Governance Bill Appeared to move towards environmental net gain, causing some concerns (e.g. Environmental Audit Committee, 2018a, para. 139) leading the Government to clarify that “biodiversity net gain is, and should remain, the central pillar around which wider approaches might be developed” (Environmental Audit Committee, 2018b, p. 16) and that “developing the concept of environmental net gain will take place over a longer timescale” (Environmental Audit Committee, 2018b, p. 17)

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2018	June	European Union (Withdrawal) Act returns to House of Commons (Maer, 2018b)	<ul style="list-style-type: none"> Lords' amendment requiring protection of EU environmental standards voted against and replaced with weaker obligation for the Government to publish environmental principles within six months of the bill and to make provisions for the creation of a public body able to take enforcement action against the government
		European Union (Withdrawal) Act receives Royal Assent	<ul style="list-style-type: none"> New amendments from the House of Commons unchallenged Set legal requirements to publish environmental principles and make provisions for a new public body for enforcement
	July	National Planning Policy Framework revised (Ministry of Housing, Communities and Local Government, 2018)	<ul style="list-style-type: none"> Strengthens wording around BNG ("should" rather than "where possible", adds "measurable"): "plans should ... identify and pursue opportunities for securing measurable net gains for biodiversity." (para. 174)
	November	EU-UK withdrawal agreement (with backstop) (House of Commons Library, 2019)	<ul style="list-style-type: none"> Required non-regression from EU environmental standards after Brexit to avoid a hard border between Northern Ireland and Ireland if the Northern Ireland protocol were triggered
		Natural England post about development and trialling of updated metric (Natural England, 2018)	<ul style="list-style-type: none"> Promised improved treatment of ecological connectivity, greater habitat type coverage, and a new spreadsheet-based tool for application

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2018	December	Government Publish draft version of Environment (Principles and Governance) Bill (Defra, 2018c)	<ul style="list-style-type: none"> Met legal requirements set by the European Union (Withdrawal) Act (2018) to publish environmental principles and make provisions for a new public body, the Office for Environmental Protection (OEP) Concern that other parts of the bill, including BNG, had not been submitted for scrutiny (Environmental Audit Committee, 2019)
2018-2019	Throughout	Multiple organisations adopt biodiversity net gain and develop biodiversity metrics	<ul style="list-style-type: none"> 'Network Rail Biodiversity Calculator' (Network Rail, 2018) Highways England 'biodiversity metric' (Highways England, 2019) Transport for London 'toolkit' (Jackman, 2019) SSE 'Full BNG Toolkit' (Scottish & Southern Electricity Networks, 2019) Balfour Beatty's A Better Balance: a roadmap to BNG (Balfour Beatty, 2018)

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2018-2019	Dec-Feb	First Defra consultation on Net Gain (Defra, 2018a)	<ul style="list-style-type: none"> Introduced the government's proposed approach to BNG Asked whether net gain should be mandated in the UK for developments in the scope of the Town and Country Planning Act (TCPA) (1990) Suggests a "a 10% gain in biodiversity units would be a suitable level of net gain to require in order to provide a high degree of certainty that overall gains will be achieved, balanced against the need to ensure any costs to developers are proportionate" and that this "would be a mandatory national requirement, but should not be viewed as a cap on the aspirations of developers" (p. 30)

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2018-2019	Dec-Feb	<p>Net Gain impact assessment published alongside consultation (Regulatory Policy Committee, 2018)</p>	<ul style="list-style-type: none"> Recommended “net gain [be mandated] through the use of a specified biodiversity metric to development in scope of the Town and Country Planning Act, and adds a tariff component for compensation that cannot be delivered on the site or locally.” (p. 1) Emphasises the multiple objectives that had driven policy development were “that net gain: (1) delivers habitat creation, meeting the government's ambition to leave the environment in a better state than it inherited it; (2) is simple, streamlined and certain for developers, easy to understand and will not prevent, delay or reduce housebuilding; and (3) is of clear benefit to people and local communities.” (p. 1) 10% is chosen for amount of gain as “the lowest level of net gain that the department could confidently expect to deliver genuine net gain, or at least no net loss, of biodiversity and thereby meet its policy objectives” (p. 20) estimated BNG would have a direct cost to developers and landowners £63.8m per year (2017 prices), with 90% of this falling on landowners due to impact on land prices <i>One of the first national policy impact assessments (if not the first) to quantify significant biodiversity/nature benefits, significant in securing political support for the policy</i>

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2019	February	CIRIA, IEMA and CIEEM publish further BNG guidance for implementation of the good practice principles (Baker, Hoskin and Butterworth, 2019)	<ul style="list-style-type: none"> Includes case studies and expansions on the original 2016 Good Practice Principles
		National Planning Policy Framework updated (Ministry of Housing, Communities and Local Government, 2019)	<ul style="list-style-type: none"> Wording on BNG does not change from 2019 version
	March	HM Treasury publishes Spring Statement (HM Treasury and Hammond, 2019)	<ul style="list-style-type: none"> Section on green growth includes the commitment that “the government will Mandate net gains for biodiversity on new developments in England to deliver an overall increase in biodiversity” (Clean growth bullet 2) <i>Unusual for non-financial policy measures to be announced this way</i>
		Government commits to mandating BNG as part of the Environment Bill (Defra Press Office, 2019)	<ul style="list-style-type: none"> Gave confirmation that BNG would be part of the Environment Bill and, if passed, become part of English law

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2019	July	<p>Biodiversity Metric 2.0 is published as a beta test for consultation by Natural England (Crosher <i>et al.</i>, 2019)</p>	<ul style="list-style-type: none"> • <i>Intended to provide a standardised metric that could be used in place of the many organisational metrics that were being developed</i> • Addition of connectivity and strategic location for the calculation of base pre- and post- intervention units • Risk factor made up of difficulty of habitat creation x time to target condition x off-site risk also included for calculating post- intervention units • Addition of new 'very high' distinctiveness score for highly threatened and internationally scarce habitats • Improved treatment of features such as urban trees and green roofs

Table 5: Events of Stage 4 (2016 to 2019), in which Brexit acts as a window to introduce BNG into legislation.

Year	Month	Event	Relevance to BNG
2019	July	<p>Summary of responses and government response to the first Defra consultation on Net Gain published (Defra, 2019)</p>	<ul style="list-style-type: none"> • Found that 78% of respondents supported mandatory net gain for developments in the scope of the TCPA • Some respondents highlighted issues such as planning authority capacity, presence of loopholes including the use of the tariff by developers to avoid responsibility, and focus on interests of developers over those of nature Committed to: <ul style="list-style-type: none"> ◦ 10% net gain with no broad exemptions ◦ support for Local Planning Authorities (LPAs) to address capacity issues ◦ creation of a publicly available register of gains ◦ exclusion of irreplaceable habitats ◦ continued evaluation and minimisation on the impact on industry

Stage 5 (2019-2021): Tug-of-war via Parliament

During this period, biodiversity net gain is presented to Parliament as part of the Environment Bill. The EU-UK withdrawal agreement is renegotiated, removing the need for environmental non-regression. Biodiversity net gain legislation is debated in parliament, with motions to strengthen BNG legislation failing, with the government stating the motions would be infeasible or disproportionate. *The significant debate around the policy is likely compounded by significant lobbying both to strengthen the policy and, on the other hand, to ensure it does not significantly impact development.* Eventually, the Environment Act gains Royal Assent, creating a legal requirement to legislate for BNG. *Also within this period, corporate interest in biodiversity increases, including the rise of discussion around 'Nature Positive'.* Key events in England during this period are shown in Table 6.

Table 6: Events of timeline Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2019	October	Final Defra impact assessment of BNG and local nature recovery strategies issued (Regulatory Policy Committee, 2019b)	<ul style="list-style-type: none"> • Language around the tariff changed, instead stating that “[d]evelopers will have the option, once mitigation hierarchy has been demonstrated, to pay for the offset of remaining units through a biodiversity units market” (p. 1) however, the option of “payment to government who will provide statutory biodiversity credits into the compensation market” (p. 24) remained • Suggested considerably higher costs to developers £199 m per year, but again with 90% of this falling on landowners through changes to land prices • Included ongoing costs to local government of £9.5nm per year, which were not included in the previous impact assessment • Regulatory Policy Committee deemed impact assessment fit for purpose (Regulatory Policy Committee, 2019a)

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2019	October	Environment Bill 2019-19 (House of Commons, 2019a) passes first and second readings in the House of Commons (Smith and Priestley, 2020)	<ul style="list-style-type: none"> Strengthened NERC (2006) general “duty to conserve biodiversity” to duty to “conserve and enhance biodiversity” Required that the “biodiversity value attributable to the development exceeds the pre-development biodiversity value of the onsite habitat” (p. 206) by at least 10% Covered developments under the TCPA (1990), excluding those permitted through development orders and urgent Crown development, making the submission and approval of a BNG plan a planning requirement Provisions for the creation of “the biodiversity gains site register”, purchase of credits from the Secretary of State, requirement to publish a national habitat map for England, and conservation covenants Included several clauses enabling the Secretary of State to propose secondary legislation to change BNG requirements after the bill becomes an Act of Parliament (known as Henry VIII clauses) Published alongside explanatory notes (House of Commons, 2019b) Concern about lack of ambition within the wider bill, multiple ministers called for the bill to be strengthened to avoid regression from the UK’s high environmental standards under the EU

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2019	October	UK Parliament net gain POST brief published (Wentworth, 2019)	<ul style="list-style-type: none"> • Gives background on net gain for use by members of Parliament
		New EU-UK withdrawal agreement (Curtis <i>et al.</i> , 2019)	<ul style="list-style-type: none"> • Removed need for environmental non-regression post- transition period
	November	Environment Bill 2019-19 falls at dissolution of Parliament (Smith and Priestley, 2020)	<ul style="list-style-type: none"> • Paused legislative process for BNG until a future Parliament
	December	Intertidal habitats added to biodiversity metric calculator (Natural England, 2019)	<ul style="list-style-type: none"> • Allowed BNG to be applied to intertidal habitats in a more standardised manner
		Environment Bill 2019-20 announced in Queen's speech (Prime Minister's Office and Her Majesty The Queen, 2019)	<ul style="list-style-type: none"> • Restarted legislative process for BNG

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2020	January-February	Environment Bill 2019-20 passes first and second readings in House of Commons (Smith and Priestley, 2020)	<ul style="list-style-type: none"> • Broadly the same as Environment Bill 2019-19 • Published alongside explanatory notes (House of Commons, 2020) • Clarified that where sites already on the biodiversity gains site register are developed again, any further gain must be measured from the final intended metric value, irrespective of whether it had already been delivered • Concerns remained over non-regression from EU standards and the level of power afforded to the OEP
	February	The Biodiversity Metric 2.0 consultation closes (Natural England, 2020)	<ul style="list-style-type: none"> • Summary and government response published in August • Allowed practical experience to be incorporated into the metric
	March	Biodiversity Net Gain: Financial & Economic Appraisal for Major Infrastructure Projects (WSP, 2020)	<ul style="list-style-type: none"> • Commissioned by Defra • “[S]hows that the predicted costs of achieving 5%, 10% or 20% BNG outcomes for six major infrastructure projects is equivalent to around 1% of the capital costs of these schemes” (p. i)

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2020	March-May	House of Commons Committee stage of Environment Bill 2019-20 (Smith, 2021a) followed by Report Stage and Third Reading (Smith, 2021b)	<ul style="list-style-type: none"> Multiple Opposition amendments put forward to strengthen the protections afforded by the Bill Calls to: make 10% a minimum that could only be revised upwards; secure gains in perpetuity; remove powers for Secretary of State to add to the list of exempted development; and strengthen OEP and its independence. All either failed on division or were withdrawn, with the Government arguing they were infeasible and disproportionate <i>Ideas such as increasing the duration of protection for gains were also unpopular with many potential habitat providers</i> Multiple Government amendments added limiting when the OEP can initiate an environmental review and initiate or intervene in judicial review proceedings
2021	February	Dasgupta review published (Dasgupta, 2021)	<ul style="list-style-type: none"> Presented research on treating nature as an economic asset, how to value biodiversity and how to treat nature as a portfolio with risk and uncertainty Showed that acting for biodiversity now was more beneficial for the economy than delaying action and that the UK needed to do more to achieve a nature positive future, which would require conserving and improving nature, changing economic measures of success, and transforming institutions and systems

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2021		Biodiversity Net Gain: Market analysis study published (eftec, WSP and ABPmer, 2021)	<ul style="list-style-type: none"> Commissioned by Defra Recommendations included: <ul style="list-style-type: none"> Increasing understanding of the BNG market Minimising Government's role as the seller of last resort Promoting good mitigation hierarchy practice Extending the BNG requirement to Infrastructure Projects Investing in institutional capacity, training and transparency, both in terms of LPAs and independent oversight
	February	Defra Biodiversity Metric 3.0 and supporting information published (Panks <i>et al.</i> , 2021)	<ul style="list-style-type: none"> Removed connectivity from the metric Was published with a small-sites metric, designed to make biodiversity assessments for small developments more proportionate Included multiple other small improvements <i>Created lots of interest from habitat providers</i>
	August	BS 8683 - Process for designing and implementing Biodiversity Net Gain published (BSI, 2021)	<ul style="list-style-type: none"> Provided a framework to demonstrate that a project has followed a process based on UK-wide good practice. Aimed to help to avoid 'greenwashing' claims around projects doing BNG

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2021	June	Government response to Dasgupta Review (HM Treasury, 2021)	<ul style="list-style-type: none"> • Government commits to 'nature-positive' future in response to Dasgupta review • Announce intention to amend Environment Bill to include Nationally Significant Infrastructure Projects (NSIPs) within BNG <i>following a positive response to this within consultations</i>
	June-September	Environment Bill 2019-20 debated in House of Lords (Smith, 2021b)	<ul style="list-style-type: none"> • Government amendment (Amendment 194B and new Schedule 14A/ Lords Amendments 55 and 93) includes NSIPs within BNG, significant as it requires BNG beyond the scope of the Town and Country Planning Act • Government amendment (Amendment 84/ Lords Amendment 91) requiring the Government to lay the new Biodiversity Metric and any amendments thereof before Parliament • Further Government amendment (Amendments 86 and 88/ Lords Amendments 57 and 92) to mean minimum duration of gains may only be increased from the 30 years initially tabled and for the potential for such an increase to be regularly reviewed (Amendment 89/ Lords Amendment 58) • Explanatory notes published prior to moving back to House of Commons (House of Commons, 2021)

Table 6: Events of Stage 5 (2019-2021), in which BNG is presented to Parliament as part of the Environment Bill and policy requirements are debated.

Year	Month	Event	Relevance to BNG
2021	September	“The State of No Net Loss/Net Gain and Biodiversity Offsetting Policy in English Local Planning Authorities” report published (Robertson, 2021)	<ul style="list-style-type: none"> • Found that: <ul style="list-style-type: none"> ◦ 56% of LPAs reported that it was currently practical to deliver biodiversity No Net Loss/ Net Gain ◦ Resourcing was the main issue for LPAs that did not feel it was practical ◦ 34% of LPAs already used some kind of metric in considering the ecological impact of planning applications ◦ 32% of LPAs already had a mandatory No Net Loss/ Net Gain requirement for at least some planning authorities
	Oct-Nov	Environment Bill 2019-20 ‘ping pong’ stages between Lords and Commons (Smith, 2021b)	<ul style="list-style-type: none"> • All Government amendments made in the House of Lords were agreed and all non-Government amendments were disagreed or removed by further amendment • Disagreement about level of independence of the OEP • Lords eventually stopped insisting the OEP had full independence to carry out its functions as it saw fit, leaving substantial limits on OEP’s power
	November	Environment Act gains Royal Assent (<i>Environment Act 2021</i>)	<ul style="list-style-type: none"> • Set the requirement for development to deliver BNG in England, subject to its later commencement, and created powers to create regulations on the detail of the biodiversity net gain requirement

Stage 6 (2022 onwards): Implementation phase

This period represents the lead up to BNG coming into force including considerable consultation on and increased clarity about how BNG will be legislated for; increased funding for LPAs; and the publishing of guidance and the statutory tools. The official mandate is repeatedly delayed, causing anger within some stakeholders. Key events in England during this period are shown in Table 7.

Table 7: Events of timeline Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2022	Jan-April	Defra consultation on Biodiversity Net Gain Regulations and Implementation (Defra, 2022a)	<ul style="list-style-type: none"> • Consulted on proposed BNG regulations, notably specifics on: <ul style="list-style-type: none"> ○ Exemptions from BNG, including whether it is correct to not exempt brownfield sites and temporary developments ○ Exclusion of irreplaceable habitats from BNG ○ Last resort of purchasing statutory biodiversity credits from the UK Government where developers are demonstrably unable to achieve biodiversity net gain through on- and off-site options ○ Intent to mandate BNG for NSIPs by 2025 ○ Suggestion that developers could sell excess BNG units ○ The biodiversity gain site register, only for off-site gains ○ Allowing stacking of biodiversity units with other payments for environmental services, “provided they are paying for distinct, additional outcomes (for example, carbon sequestration and biodiversity benefits)” (p. 75) • Alongside this, the Government announced £4 million in funding for LPAs to prepare for mandatory BNG (Defra <i>et al.</i>, 2022)

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2022	March	Joint open letter to Secretary of State for Levelling Up, Housing and Communities, Secretary of State for Environment, Food and Rural Affairs, and Chairman of Natural England (zu Ermgassen et al., 2022)	<ul style="list-style-type: none"> Called for care to be taken that BNG fulfil its potential for nature recovery Pointed out potential for BNG to allow loss of English nature if units promised fail to materialise Highlighted three key issues for BNG to produce genuine gains: <ul style="list-style-type: none"> Need for credible mechanisms for monitoring and enforcement of gains Under-resourcing and skills deficit within local authorities, leading to limited oversight of BNG projects; and Dominance of on-site gains as opposed to more ambitious and coordinated nature recovery efforts
	April	Defra Biodiversity Metric 3.1 and supporting information released (Panks et al., 2022)	<ul style="list-style-type: none"> Relatively small changes from 3.0, mainly focussing on clarifying guidance and revising condition assessments (Natural England, 2022)
	June	Defra consultation on marine net gain (Defra, 2022b)	<ul style="list-style-type: none"> Proposed looking at both habitats and species Incorporation of environmental benefits conferred by biodiversity, while remaining 'nature first' Potential for a contributions-based rather than metric-based approach Considered pressure-reduction, as well as restoration. Will be mandatory

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2022	June	OEP mission statement published (Office for Environmental Protection, 2022)	<ul style="list-style-type: none"> “[T]o protect and improve the environment by holding the government and other public authorities to account” (p. 5) Confirmed the OEP would oversee LPAs, not be oversight for individual net gain projects
	June	ALGE publish results of Defra-funded survey looking at local authority capacity to carry out BNG (Snell and Oxford, 2022)	<ul style="list-style-type: none"> Found that LPAs are lacking the ecological capacity required for BNG Only 5% of respondents felt they currently had adequate ecological resource to scrutinise all applications that might affect biodiversity Fewer than 10% reported their current expertise and resources will be adequate to deliver BNG Nearly half stated they do not regularly look at any advice or guidance
	July	Government response to joint open letter (Benyon, 2022)	<ul style="list-style-type: none"> Stated that work is being done on how to better enforce BNG and that the “Levelling Up and Regeneration Bill” will help to strengthen enforcement powers Stated further funding for LPAs would be announced and changes to planning fees would also help with resourcing Investigating inclusion of on-site gains in register Future review of monitoring duration Creating guidance about thresholds to be able to move to the next stage of the mitigation hierarchy

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2022	Aug-Sept	Technical consultation on the biodiversity metric (Defra, 2022c)	<ul style="list-style-type: none"> Sought opinions on the metric prior to publishing the version that would likely become statutory
2023	Jan	Environmental Improvement Plan (update to 25 YEP required by Environment Act) (HM Government, 2023a)	<ul style="list-style-type: none"> Information on markets – publish policy framework in spring 2023 as part of updated Green Finance Strategy 10% mandate to be introduced from November 2023 Confirmed further funding would be available for LPAs Mentioned exploring marine net gain Cost recovery for environmental regulators
	February	Stacking guidance published (Defra and Natural England, 2023)	<ul style="list-style-type: none"> Confirmed stacking would be allowed with nutrients units For voluntary schemes, e.g. carbon credits, only biodiversity units above what would have been created by standard practice for the voluntary credits can be claimed, e.g. further habitat enhancements that do not impact the carbon value
2023	February	Nationally Significant Infrastructure: action plan for reforms to the planning process published (Department for Levelling Up, Housing & Communities, 2023)	<ul style="list-style-type: none"> Sets November 2025 as the date from which BNG will be mandated for NSIPs Confirms they will be subjected to the same 10% gain maintained for 30 years as other developments Also confirms that marine net gain will be mandated, but does not give a date

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2023	February	Government response to Defra consultation on BNG regulations and implementation (Defra, 2023c)	<ul style="list-style-type: none"> • Confirmation of an extra £16.71 million of funding for LPAs to prepare for mandatory BNG • Defined the scope of BNG (i.e. what will be exempted) • Stated that secondary legislation on definitions of irreplaceable habitats will be added in future • Confirmed sale of 'excess' on-site gains will be allowed • No centralised trading platform or recording of credit prices • No register for on-site gains, but investigating how to add information on on-site gains already within planning applications to the register • LPAs will be enforcing BNG, then they will be held accountable by OEP
	March	Defra Biodiversity Metric 4.0 and supporting information published (Natural England, 2023b) Government response to consultation on the biodiversity metric (Defra, 2023a)	<ul style="list-style-type: none"> • Changes made primarily focused on ease of use (Natural England, 2023a) • Also changes to spatial risk multiplier • Would likely form the basis of the statutory metric after being put before Parliament, expected to be in November 2023 (Burke, 2023) <ul style="list-style-type: none"> • Will consider species inclusion for next metric update

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2023	March	'Mobilising Green Investment' the Government Green Finance Strategy published (HM Government, 2023b)	<ul style="list-style-type: none"> Set target to “mobilise at least £500 million of private finance per year into nature’s recovery in England by 2027” (p. 74) citing BNG as a part of achieving this
		Summary of responses to Defra consultation on marine net gain published (Defra, 2023f)	<ul style="list-style-type: none"> Respondents highlighted need for ecosystem approach considering species and off-site impacts. 81% of respondents agreed Marine net gain should be mandatory.
	May	Guidance for selling offsite units (Defra, 2023d)	<ul style="list-style-type: none"> Reiterates points made in previous documents
	July	UKHab 2.0 released	<ul style="list-style-type: none"> Changes made to add new habitats and increase standardisation of use. Changes to codes mean not all habitats align with the previous UKHab 1.1
	September	BBC Report on “delays” to BNG (BBC News, 2023)	<ul style="list-style-type: none"> <i>Information about delays to BNG policy is leaked to the BBC</i>

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
		UK Government release updated timeline for BNG (Defra, Department for Levelling Up, Housing and Communities and Harrison, 2023)	<ul style="list-style-type: none"> Published later the same day as BBC report on delays Moves expected date of mandate for most developments to January 2024 Dates for other projects remain as April 2024 for small sites, and 2025 for Nationally Significant Infrastructure Projects. Commitment to publish the required guidance and regulations by the end of November
2023	September	Taskforce on Nature-related Financial Disclosures (TNFD) UK regional launch (TNFD, 2024)	<ul style="list-style-type: none"> Aim “to support a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes”
	October	Levelling-up and Regeneration Act 2023 gains Royal Assent (Levelling-up and Regeneration Act, 2023)	<ul style="list-style-type: none"> Adds detail to the Town and Country Planning Act around the correct baseline to use in cases where the value of a habitat has been reduced prior to development
	November	Original expected date of mandatory BNG	<ul style="list-style-type: none"> Three months before eventual mandate

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
		Government publish draft Statutory Metric and guidance (Defra, 2023e)	<ul style="list-style-type: none"> Draft Statutory metric has small updates from Defra metric 4.0 with updated guidance, including a very short list of irreplaceable habitats Introduction of Biodiversity Gain Hierarchy, only requiring the mitigation hierarchy to be followed for habitats classified as 'high' distinctiveness or higher, causing considerable controversy (Colley, 2023)
2023	December	"Is England ready for biodiversity net gain?" Webinar (Rojo Martin, 2023)	<ul style="list-style-type: none"> Potential for draft guidance to change after concerns about Biodiversity Gain Hierarchy Indicates there are likely to be changes to stacking guidance. Confirms early 2023 date for BNG mandate if "it's not January, it will be 2 February, for instance" – Lucy Cheeseman, DEFRA deputy head of land use and head of net gain
		Government publish response to Marine Net Gain consultation (Defra, 2023b)	<ul style="list-style-type: none"> Confirms inclusion of both biodiversity and wider environmental benefits and use of both active and pressure reduction interventions States the Government will continue working on an assessment framework and run proof of concept projects

Table 7: Events of Stage 6 (2022 onwards), in which mandatory BNG is implemented.

Year	Month	Event	Relevance to BNG
2024	January	Rescheduled expected date of BNG mandate (Defra, Department for Levelling Up, Housing and Communities and Harrison, 2023; Vaughan, 2024)	<ul style="list-style-type: none"> • Expected date of mandate delayed to February 2024 for major developments and April for small sites
	February	BNG mandated for major developments of February 12th (Fisher, 2024)	<ul style="list-style-type: none"> • Date from which 'large' developments within the scope of the Town and Country Planning Act will be required to demonstrate a 10% biodiversity net gain to get planning permission • State that guidance has been updated based on stakeholder comments
2024	April	BNG mandated for small sites (Gowers, 2024)	<ul style="list-style-type: none"> • Date from which small sites within the scope of the Town and Country Planning Act will be required to demonstrate a 10% biodiversity net gain to begin work
2025	November	Expected date of BNG mandate for Nationally Significant Infrastructure Projects (Defra, Department for Levelling Up, Housing and Communities and Harrison, 2023)	<ul style="list-style-type: none"> • Date from which NSIPs are expected to be subject to mandatory BNG

3.5 Conclusions

This timeline represents an important step in documenting the inception and evolution of BNG policy in England. From the events chronicled within, I can place BNG as following the failed attempt to legislate for biodiversity offsetting in the 2010s and as the conclusion of a decades-long push to increase the role of private finance and market-based instruments in biodiversity conservation in England. I can also begin to tie this to the typically neoliberal aims of deregulation, notable in the discussion of moving away from 'Big Government' present in the 2011 White Paper, and 'green growth', the heading under which the commitment to mandate BNG was announced in HM Treasury's 2019 Spring Statement. Particularly relevant to this second aim is the continual emphasis that BNG should benefit, or at the very least not harm, development in England, resulting in what some commentators argue is a lack of ecological ambition within the policy, see for example the justification for setting 10% as the level of gain in the 2018 impact assessment of the policy. This begins to reveal the conflict between creating a system that is easy to use and delivers benefits for development, and a system that comprehensively protects biodiversity, something that requires further work to truly disentangle.

Beyond the conclusions drawn here, this timeline has two main uses: the first is a source of learning for countries and institutions looking to implement similar policies; and the second is as a starting point and collection of documents for analyses of Biodiversity Net Gain in England. As BNG practice develops and issues inevitably arise, as with all policies, I hope this timeline will be used to understand the root of such issues, thus helping develop solutions. I believe the timeline also has many other potential uses, such as: a starting point better understand how BNG interacts with other English policies and the emerging concept of 'Nature Positive'; in future research on the changing value given to, and language used for biodiversity in English policy; and understanding political undercurrents that have driven the path of events seen in this timeline. It is only with such research we can create an understanding of what

policies like BNG are likely to mean for nature in the context of their accelerating adoption globally.

In documenting and ordering the events that led to BNG and its implementation, one can begin to draw conclusions about how they might influence its acceptance and implications for SLO. The first and perhaps most important, thing to draw out is that the conflicts surrounding BNG are long standing and deep rooted, stemming from a fundamental conflict within the very motivations for the policy, namely the push for market-based funding for biodiversity and streamlining development process. From this timeline one can see these sources of controversy are not incidental impacts of the approach taken to BNG, instead they are fundamental design features. One can begin to build a picture of some of the factors that may influence the acceptance of BNG. It is, ultimately, a policy divided, drawing legitimacy from varied stakeholders for its potential to reconcile environmental protection and continued economic growth but repeatedly struggling to fully meet the requirements of either side without compromising the other. It is with this in mind that I continue my analysis of the acceptance of BNG, a policy conflicted, and what it might mean for the SLO of projects required to follow the approach. In the next chapter, I begin this with a surface-level analysis of the general public's opinions of BNG as a policy, allowing an understanding of the extent to which the aforementioned conflicts within BNG are salient outside of communities with a strong understanding of and interest in the policy. I then assess whether and how these conflicts were raised within early discussion around mandatory BNG, before finally looking at a real-life case study to understand the extent to which they influence opinions beyond the theoretical.

Chapter 4 Public Opinions of a Net Outcome Policy: The Case of Biodiversity Net Gain in England

4.1 Abstract

Increasingly, there is social pressure for organisations and governments to recognize and address their biodiversity impact or risk reputational (and potentially financial) damage. Biodiversity Net Gain (BNG) is being introduced globally as a means of addressing biodiversity loss and has recently been mandated in England. Understanding public opinions of BNG is crucial for assessing the likelihood of BNG-related project rejection, which has significant implications for operational risk. Using a questionnaire with a nationally representative by age and gender (for England) sample of 500 people, I found that most respondents had limited knowledge of BNG but generally accepted its core assumptions: that habitat creation, restoration, or enhancement can achieve net biodiversity gains after development losses, and that biodiversity can be measured using a standardized metric. While distrust was high among most actors involved in BNG, ecological consultants and wildlife charities were trusted. Over half of the respondents felt that a project's environmental impact is acceptable if it achieves BNG. As a result, BNG may act to reassure the majority of the public about a project's biodiversity impacts thereby reducing operational risk. My findings suggest four strategies to further boost BNG's acceptability: providing understandable information for stakeholders, involving trusted actors like wildlife charities, avoiding the use of pre-existing biodiversity credits; and ensuring developers are seen as responsible for compensatory sites.

4.2 Introduction

Biodiversity net gain (BNG) was consulted on as a potential policy in England in 2018 in the hope that a “transparent and consistent requirement could provide certainty, allowing developers to factor in [biodiversity] obligations up front” (Defra, 2018a, p. 10). Having become mandatory in February 2024 (Chapter Three), BNG requires most terrestrial developments to demonstrate at least a 10% increase in the value of biodiversity assessed using the statutory metric, hereafter referred to as ‘the metric’, through on- or off-site compensation measures (Natural England, 2022). As a policy, BNG reflects the previous Conservative Government’s desire to increase the use of private investment and market-based instruments in nature conservation and follows on from a failed attempt to introduce Biodiversity Offsetting (BDO) in the 2010s (Chapter Three), which proved decidedly unpopular and gained the moniker of being a “Licence to Trash” (e.g. Carrington, 2013; Howarth, 2013).

Part of the uncertainty faced by developers during the planning process is community acceptance as, without it, planning applications may be rejected (e.g. Roddis et al., 2018) and projects can be subject to protests which can cause significant costs and delays (Franks et al., 2014). During the introduction of BNG, it was hoped that “reassured by a robust biodiversity net gain policy, local communities could be more confident in accepting development” (Defra, 2018a, p. 2). As a result of this, the extent to which the public (and other stakeholders) understand and accept BNG has the potential to significantly impact the reputational and financial risks associated with development, particularly where developers are relying on BNG to achieve acceptance of their development’s biodiversity impacts. Despite the hopes that BNG would reassure stakeholders, cases have been seen where the environmental impacts of projects using BNG as part of their environmental strategy have been rejected by local communities, with arguments reflecting those levelled against BDO (e.g. Apostolopoulou, 2020; Environmental Law Foundation, 2023).

Much of the disdain towards offsetting revolved around its framing of biodiversity as isolated and ‘placeless’ (Apostolopoulou & Adams, 2015), which underpins two of the central assumptions of BNG: that biodiversity can be measured and compared with a standardised numeric metric; and that the production of one ‘bit’ of biodiversity can be used to replace the loss of another to achieve a neutral or positive net outcome. Further adding to this was a sense that actors involved in BDO, namely developers and Local Planning Authorities, were using it to depoliticise and push through development that should not be given planning permission due to significant environmental and social impacts (Apostolopoulou, 2020). If this perception remains true for BNG it is likely to reduce trust in both the developer and Local Planning Authority. As trust is a key element in individuals’ decisions on whether to accept a project (Chapter Two), and such is likely to have substantial implications for the acceptance of BNG as a whole.

The approach taken to BNG also has the potential to impact individuals’ decisions to accept BNG. Where the approach to compensation is seen as lower risk, individuals may feel less vulnerable and thus be more likely to accept the project even with relatively low levels of trust (Chapter Two). Within other environmental policies and areas, such as tackling climate change, there is a push for the ‘polluter pays principle’, in which developers are required to pay for the remediation of any environmental impacts they cause (Damiens et al., 2021). However, the ability to simply buy pre-made ‘units’ of biodiversity is seen by some as a way for organisations to shirk their environmental responsibilities, allowing environmentally harmful business-as-usual to continue (e.g. Biodiversity Net Positive, 2023; Dasgupta, 2024). As such, it is important for developers to know whether buying biodiversity units is seen as an acceptable way of achieving BNG, as this is currently a widely used strategy for small developments (Rampling et al., 2024).

It is of note that, when the Department for Environment and Rural Affairs (Defra) ran a consultation on whether net gain should be mandated in 2018, BNG proved popular, with 78% of respondents supporting BNG being made a

mandatory requirement and broad acceptance across all stakeholder groups that responded, including a majority of those responding as individuals (Defra, 2019). This represented a substantial change from BDO when the equivalent consultation in 2013 found only 53% supported the introduction of a biodiversity offsetting system in England, with very little support from individual respondents (Defra, 2016). This is despite BNG not addressing the fundamental objections to BDO, sharing the same assumptions, as discussed above, and broadly using the same tools and methods (Chapter Three). Further, the ten percent ‘gain’ within the English BNG policy was chosen as “the lowest level of net gain that the department could confidently expect to deliver genuine net gain, or at least no net loss, of biodiversity” (Regulatory Policy Committee, 2018, p. 20). This means that the main difference between the two policies, and thus subsequent differences in opinion, is one of framing, moving from talking about ‘offsets’ to ‘gains’.

Our knowledge of opinions of BNG comes from consultations and protests, which tend to consist of highly engaged and/or motivated stakeholders, often with significant knowledge of and experience with BNG. It is thus hard to know whether they represent the more general public’s views on BNG. This reduces our understanding of how likely it is that the BNG aspects of projects will be rejected and thus has significant implications for operational risk.

The objective of this research was to gain a broad understanding of the public’s knowledge of and opinions about BNG, both to inform practice and understand where further research is required to achieve socially acceptable BNG. I used a questionnaire distributed through a research panel to assess the opinions of a sample of 500 people, nationally representative by age and gender, to address the following broad research question: do people accept BNG as an approach to the environment? To answer this, I will look at the following sub-research questions:

1. What is the public’s knowledge of and experience with BNG?
2. Do the public believe the assumptions behind BNG?

3. To what extent do the public trust the organisations involved in BNG?
4. What is the public's opinion of BNG as an approach? What predicts this?
5. What is the public's desired approach to BNG?

4.3 Methods

Data was gathered using an online survey of 500 adults living in England between the 18th and 23rd July 2024 inclusive. Participants were recruited through Respondi, a commercial research panel who provide participants a small incentive for completing the survey. The questionnaire survey was designed to take around ten minutes to complete and was accessed in a web browser. A pdf version of the questionnaire has been included as Appendix 3A. Interlocking age and gender quotas (detailed in Appendix 3B, Table 3B.1) were used to ensure a broadly representative sample. A total of 937 people were sent the questionnaire, of which 113 did not start; 109 were screened out due to not consenting or not meeting the participant requirements (over 16 and living in England); 136 were rejected due to their respective quota being full; 79 were suspended due to over 30 minutes of activity; leaving 500 completed surveys. Details of the sample are available in Appendix 3B.

The authors recognise that incentivising respondents can increase rates of careless responding, this is thought to be at least in part due to recruiting less interested respondents (Jaeger & Cardello, 2022). The accurate identification of careless responses is challenging, with no single agreed upon metric (e.g. Conrad et al., 2017; Greszki et al., 2015; Jaeger & Cardello, 2022). As this analysis is aiming to assess the opinions of the general population, some extent of disinterest is both expected and important. This, combined with previous findings that low-quality “speeder” responses (those where the survey has been completed faster than expected) added random noise to data but made little difference to the results drawn (Greszki et al., 2015), led us to choose not to remove these responses.

To account for the impact “speeder” responses may have had on my results, I tested the sensitivity of my results to two minimum time thresholds. The first was a more extreme version of the psychological threshold based on reading speed used by Conrad *et al.* (2017) amongst others, removing respondents who answered in less than 2.67 minutes (“extreme speeders”: 18 respondents), the estimated time taken to read only the questions assuming the disputed “skimming” speed of 450 words per minute (wpm) (Carver, 1992 *per* Brysbaert, 2019). The second threshold removed respondents who answered at least 30% faster than the median completion time of 7.45 minutes (“up to 70% median speeders”: 111 respondents), used as an “inclusive” threshold for speeding by Greszki *et al.* (2017). The treatment used for “speeder” responses did not impact direction or significance for most analyses; where there was a difference, this is discussed in text.

After agreeing consent and giving basic demographic information (age, gender identity, education), the questionnaire was split into five sections relevant to this chapter: an introduction to BNG; knowledge and opinions of the metric; preferences for compensatory habitat; extent of trust in actors involved in BNG; and overall opinions of BNG as an approach. A short introductory text was given at the beginning of each section introducing a new concept (i.e., all but demographic information and overall opinions) to ensure the respondents had enough knowledge to answer the questions. This work was approved by the University of East Anglia Faculty of Science Research Ethics Subcommittee (Application ID ETH2324-2530). All data were analysed and visualised in R using the packages MASS, tidyverse, ggpubr, HH, psych, knitr, MuMIn, car, DescTools, pmr, lmtest, and svglite. Where correlations are reported, their strengths are given using the conventions set out in Dancey & Reidy (2007) i.e., no correlation if $|r| < 0.1$; weak correlation if $0.1 \leq |r| \leq 0.35$; moderate correlation if $0.35 < |r| \leq 0.65$; strong correlation if $0.65 < |r| < 1$; or perfect correlation, if $|r| = 1$.

4.4 Results

4.4.1 What is the public's knowledge and experience of BNG?

Respondents were asked whether they had experience of projects aiming to achieve BNG, with 21% (105) responding that they had experience with BNG (see Figure 7). Of these, 48.6% said they had experience of a local project aiming to achieve BNG, 26.7% said they had experience of a non-local project, 25.7% said they had experience of BNG at work (industry), 25.7% said they had academic experience of BNG, and 5.7% said they had some other experience.

Both knowledge of BNG as a whole and knowledge of the Metric were significantly associated with whether the respondent reported having experience with a project aiming to achieve BNG (Figure 7), with respondents who reported having experience of BNG tending to report greater existing knowledge of both. Knowledge of BNG and knowledge of the metric were also significantly associated ($\chi^2 = 231$, $df = 12$, $p\text{-value} < 0.0001$) meaning that respondent who knew more about one than average, also knew more about the other than average.

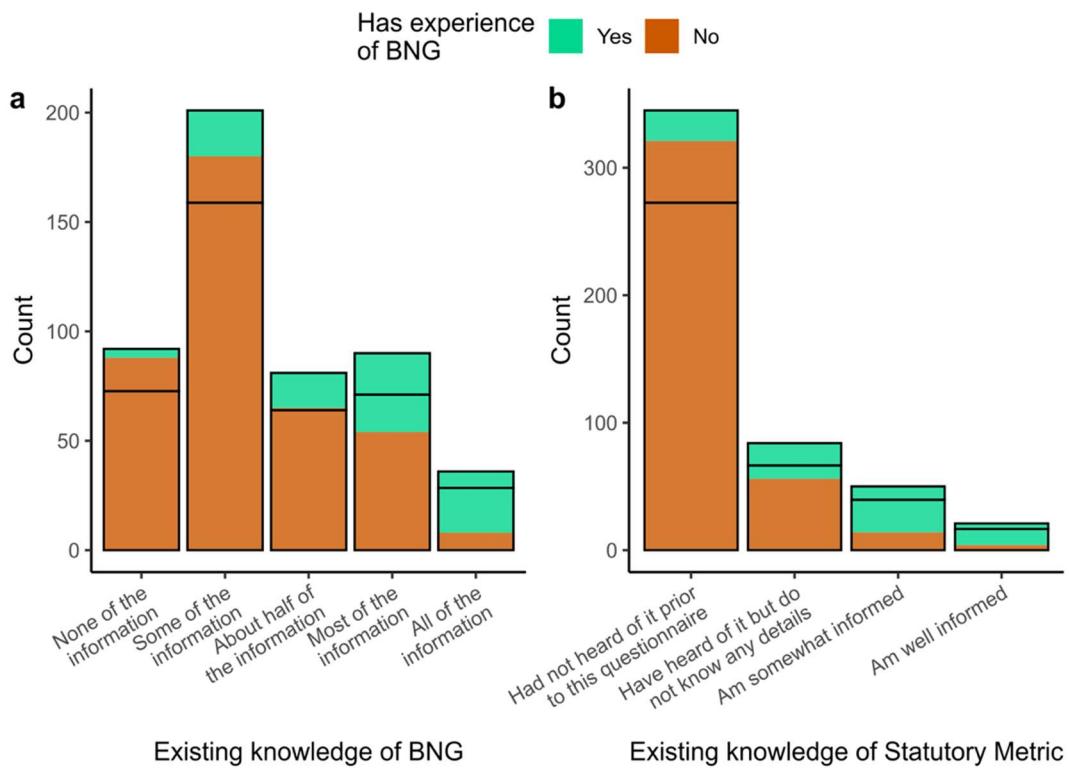


Figure 7: Existing knowledge of: (a) BNG as a whole, measured as the proportion of a short paragraph on BNG respondents reported that they already knew ($\chi^2 = 118$, $df = 4$, adjusted p -value < 0.0001), and (b) the metric, measured by asking how much the respondent knew about the metric ($\chi^2 = 173$, $df = 3$, adjusted p -value < 0.0001). Both plots are coloured according to whether or not the respondent reported having experience with a project aiming to achieve BNG and the expected distribution if experience were distributed evenly across levels of knowledge is shown with black lines.

The information given on BNG that formed the basis of my measure of existing knowledge was very basic, with some of it just introducing biodiversity as a concept, meaning that these results suggest the public have a very low level of existing knowledge of BNG. It is surprising, then, that multiple respondents claimed they were 'somewhat informed' or 'well informed' about the metric without having known all of this information, suggesting they may have misinterpreted the question or over-stated their own knowledge, a known phenomenon within measures of self-reported expertise (e.g. Snibsøer et al., 2018). The number of respondents reporting experience of BNG was also surprisingly high given its recent mandate. This could be for one of three reasons: the proportion of the English public with experience of BNG is higher

than expected; respondents said they had experience of BNG thinking it may be required for them to continue the questionnaire (Krosnick, 1991); or, there are respondents who falsely believe they have experience of projects aiming to achieve BNG, meaning their opinions may be based on experiences that do not actually represent BNG itself. More research is required to understand which of these (or combination of these) is true and, if it is the third option, how this might impact acceptance of BNG.

4.4.2 Do the public believe the assumptions behind BNG?

The questionnaire asked about two beliefs related to BNG (Figure 8): whether respondents believed it was possible to create a net gain in biodiversity by creating, restoring and enhancing habitat after a development causes biodiversity loss (BNG belief) and whether respondents believed it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric (measurement belief). Most respondents believed it was possible to create a net gain after a loss due to biodiversity (58.2% yes, 30.8% don't know, 9.8% no). Less than half of respondents believed it was possible to measure biodiversity with a standardised numeric metric, with many responding that they did not know (42.8% yes, 41.2% don't know, 14.8% no). Five respondents responded "Other" for the BNG belief and six responded "Other" for the measurement belief. Across both questions "Other" answers either gave more nuanced understanding or expressed uncertainty; due to the very small number I removed the "Other" responses from the subsequent analysis. The two beliefs were significantly associated with one-another, with respondents tending to give the same answer for both questions (Figure 8).

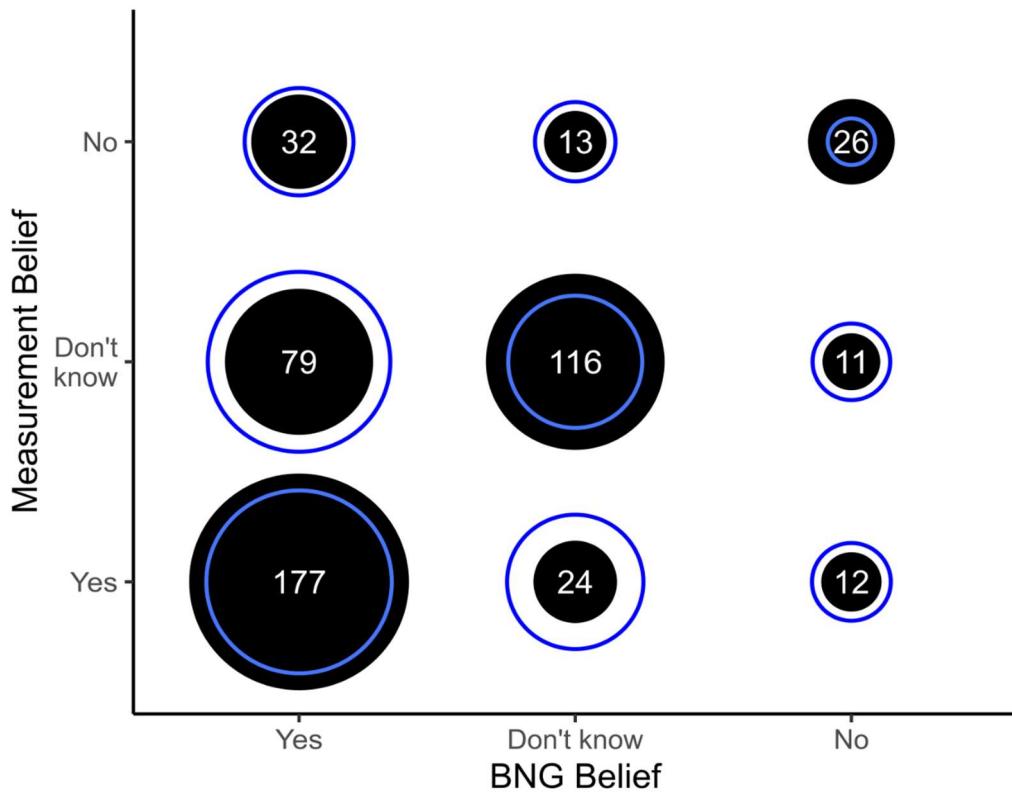


Figure 8: Respondents' beliefs in whether it is possible to achieve a net gain in biodiversity through habitat creation, restoration, and enhancement after a loss due to development (BNG belief) and whether it is possible to measure biodiversity with a standardised numeric metric (measurement belief) were significantly associated with one-another, with respondents tending to give the same answer for both questions ($\chi^2 = 170$, $df = 4$, $p\text{-value} < 0.0001$). Filled black circles and white text labels show the number of respondents who gave each pair of answers, with expected values if the two beliefs were independent shown using a blue ring.

Due to the high proportion of “Don’t know” responses to the measurement belief (believing it is possible to measure biodiversity with a standardized numeric), I hypothesised that respondents’ answers may have been influenced by a lack of information on the topic. Where people do not have an internal model for how something, such as the ‘netting’ of biodiversity, may be done, they are unlikely to believe it is possible (Suchman, 1995). To assess this, I modelled respondents’ answers to the metric belief question (whether it is possible to measure and compare biodiversity using a standardised numeric metric) predicted by their existing knowledge of the metric, whether they had

chosen to see the additional metric information (optional) before answering the metric belief question, and their BNG belief. I ran two nested models, the first assessing what affects whether a respondent answered “Don’t know” to the metric belief question. Respondents that did not choose to see the metric information were five times more likely to answer “Don’t know” to the measurement belief question. I then ran the second model, for respondents that did not answer “Don’t know”, assessing what affected whether they answered “Yes” or “No”. Within the respondents that answered either “Yes” or “No” to the measurement belief question, those that had chosen to see the metric text were 2.6 times more likely to answer “Yes”. This result was significant within the full sample and with “extreme speeders” removed, and near-significant ($p = 0.07$) after removing “up to 70% median speeders”. Full summaries of the analysis for the whole sample are presented in Appendix 3D.1.

Where stakeholders are undecided or weakly against BNG, providing simple, logical, and easy to understand information about BNG and how it fits in with society may increase acceptance of these beliefs (Leeuwerik et al., 2021; Saenz, 2019; Suchman, 1995). However, this will only increase acceptance where the additional information provided fits with the stakeholders’ existing belief systems and their experience of reality (Powell & DiMaggio, 1991 per Suchman, 1995). For example, informed, political arguments are often made against BNG, the metric, and the framing of biodiversity as “placeless” (see e.g. Apostolopoulou & Adams, 2015 as an example) which are highly unlikely to be resolved through providing more information. It is also important to note that I asked respondents whether it is possible to create a net gain after a loss of biodiversity and measure biodiversity with a standardised numeric metric, not whether it is possible in all cases. It is likely that there are certain places or habitats individuals particularly value and do not see as “offsettable”; more research is required to understand the extent to which this is predictable and how large an impact it has on acceptance.

4.4.3 To what extent do the public trust the organisations involved in BNG?

Figure 9 shows the level of trust assigned to the main actors in BNG: wildlife charities and ecological consultants were the most trusted actors, with most respondents stating they somewhat or strongly trusted these actors. By contrast, more respondents express distrust than trust in local planning authorities, developers, private landowners, government agencies, and central government. There was a positive correlation between the level of trust assigned to almost all actors (Supplementary Figure 3C.1), with the exception of wildlife charities and developers, and wildlife charities and private landowners. Trust in wildlife charities and ecological consultants was weakly correlated with all other actors, with the exception of trust in ecological consultants and local planning authorities, which was moderately correlated. Trust in central government and government agencies showed the strongest correlation ($r = 0.85$), and trust in government agencies and local planning authorities was also strongly correlated ($r = 0.66$). There was a moderate correlation between trust in all other actors. For easier analysis, actors were averaged into three groups: external expertise (wildlife charities and ecological consultants); financial beneficiaries (developers and private landowners); and governing bodies (Local Planning Authorities, government agencies, and central Government). Trust in external expertise was weakly positively correlated with both other actor groups, whereas there was a strong positive correlation between trust in governing bodies and financial beneficiaries (Supplementary Figure 3C.2).

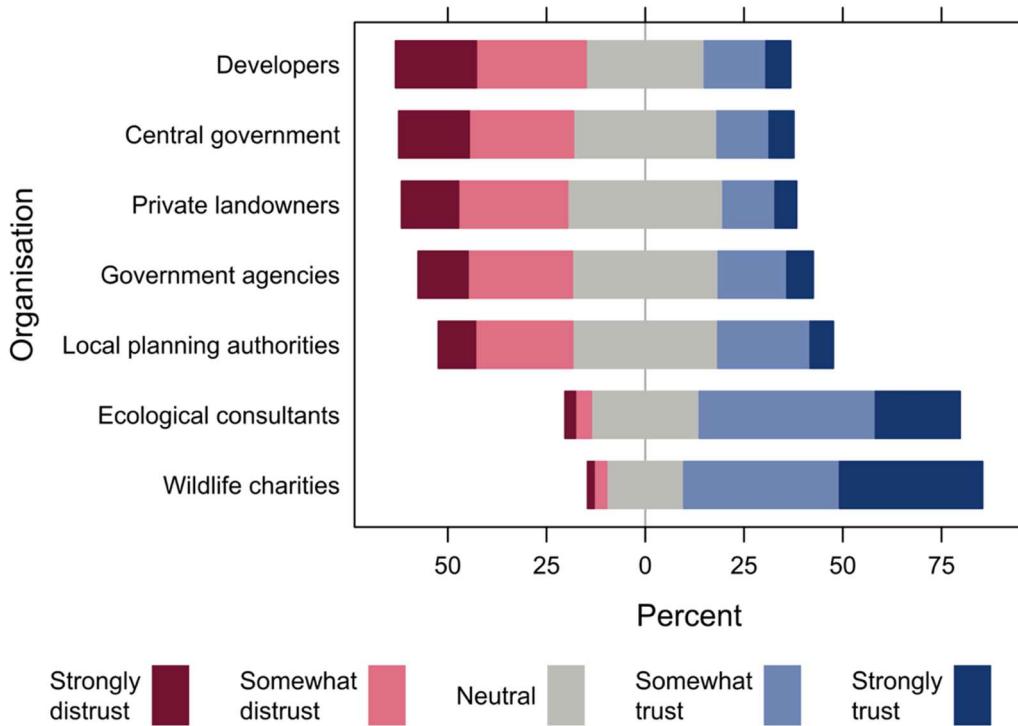


Figure 9: Respondents' level of trust in organisations involved in Biodiversity Net Gain, ordered from least trusted at the top (developers), to most trusted at the bottom (wildlife charities).

The substantial levels of distrust in developers and private landowners is not a new finding, in fact, a survey by the developer Grosvenor found that only 2% of the UK public trusted developers, with most citing that their distrust was because developers “only care about making money” (Champ, 2019, para. 3). The distrust of governing bodies, again, reflects a wider lack of trust in local and national governing bodies in the UK (ONS, 2022). I hypothesise that this distrust in the context of BNG is a product of two things. Firstly, since its conception as a policy in England one of the primary focuses of BNG has been to benefit, or at least not harm, development (Defra, 2018a). Although respondents may not know this about BNG, especially given the relatively low existing knowledge, the approach is consistent with the wider neoliberal stance of the UK government (Knight-Lenihan, 2020). Where regulators are seen as overly pro-development, stakeholders are less likely to be confident that their interests, in this case the protection of the environment, are being adequately

prioritised (Lesser et al., 2021; Prno & Slocum, 2014). Secondly, both within BNG and more widely, there is a lack of capacity within Local Planning Authorities to assess and enforce BNG (Robertson, 2021), meaning even where governing bodies are seen as having good intentions, they may not be seen as likely to carry through on them (Chapter Two). This lack of trust in governance structures is likely to reduce the acceptance of BNG as an approach to the environment.

4.4.4 What is the public's opinion of BNG as an approach?

Most respondents had a positive overall opinion of BNG (Figure 10a; 63.8% positive, 6.4% negative); felt the Metric was an effective tool for measuring biodiversity (Figure 10b; 68.5% positive, 17.3% negative); and agreed that BNG would both improve nature in England and make a project's environmental impacts acceptable (Figure 10c; 70% positive, 6.4% negative, and 55.6% positive, 10.4% negative respectively). This positivity aligns with the support for a BNG mandate seen within the 2018 Defra consultation on BNG (Defra, 2019) and suggests that the positive framing of BNG has been effective. This indicates that the BNG mandate should not initially increase operational risk for developers and may act to reassure the majority of the public about a project's biodiversity impacts.

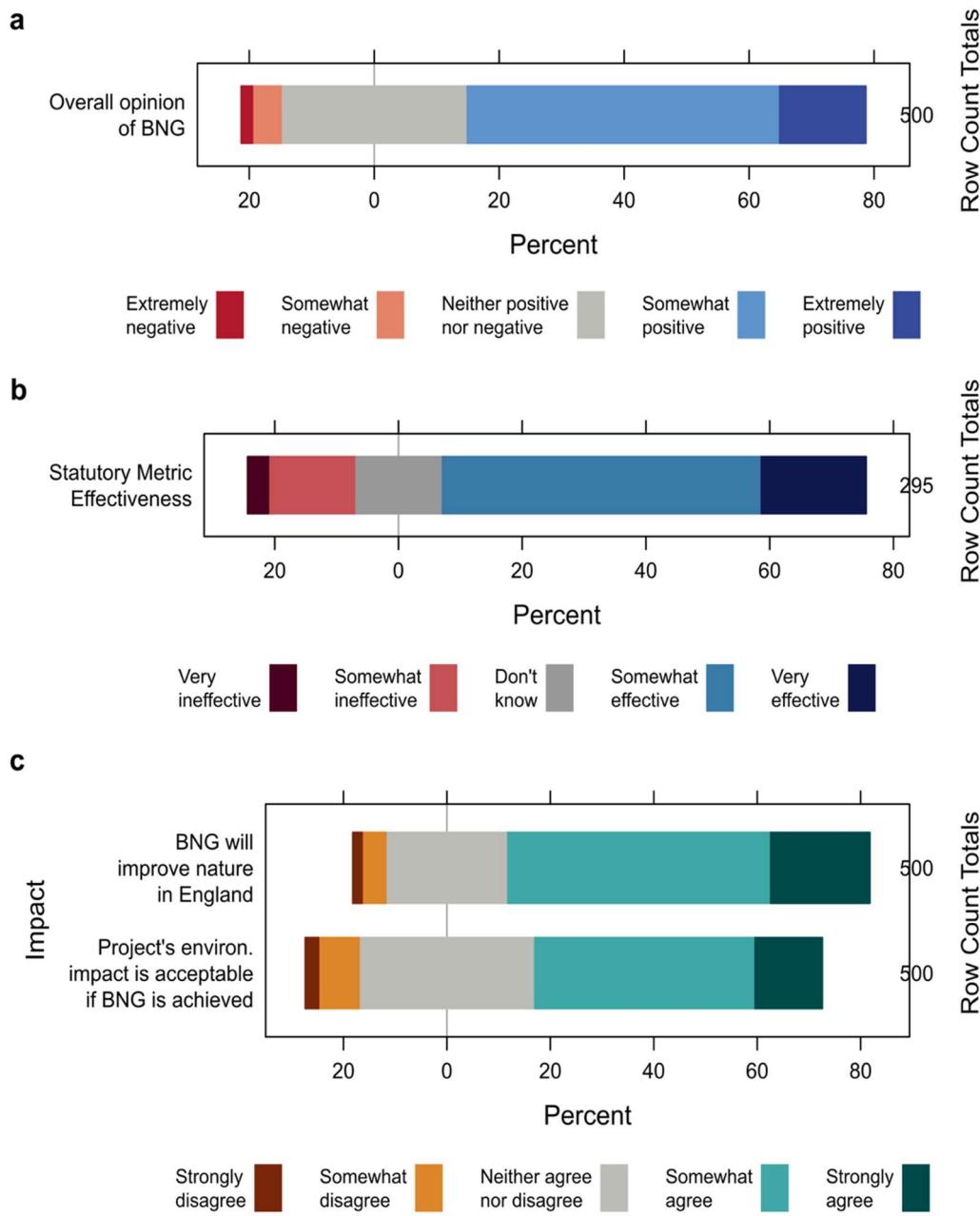


Figure 10: Respondents' opinions of (a) Biodiversity Net Gain as an approach to the environment; (b) the effectiveness of the metric at measuring the value of biodiversity; and (c) the impacts of following BNG as a policy.

It is important to note that, for most respondents, these opinions were based on very limited understanding of BNG and the metric (see Section 4.3.1) and the metric text providing only basic and un-nuanced information about its components for those who chose to read it. It is increasingly accepted that the valuations and equivalence provided by the Metric do not necessarily correlate with the biological reality of habitats (e.g. Duffus et al., 2024; Hawkins et al.,

2022; Marshall et al., 2024) meaning that, even where compatible within stakeholders' belief systems, with increasing knowledge there is the potential that these results will drift towards more negative opinions, leading to potential rejection of BNG for not reflecting stakeholders' experiences of reality. More detailed research is required to understand if, and at what point of knowledge, this occurs.

I modelled respondent's overall opinion of BNG predicted by their BNG belief, measurement belief, whether they had experience with BNG, existing knowledge of BNG, existing knowledge of the metric, trust in external expertise, trust in governing bodies, trust in financial beneficiaries, age, gender identity, and education. The modelling process is described in Appendix 3D.2. Across all models, believing it is possible to measure biodiversity with a standardized numeric (measurement belief), trust in external expertise, trust in governing bodies, higher educational attainment, existing knowledge of the Metric, and believing it is possible to create a net gain in biodiversity after a loss had a significant positive effect on overall opinion of BNG as an approach. The relationship between overall opinion of BNG and education had a significant negative quadratic component, meaning the difference between educational categories decreased at higher education levels. Existing metric knowledge had a significant positive quadratic component, meaning the difference between amounts of knowledge increased at higher knowledge levels. All significant variables are shown in Figure 11. Neither education nor existing knowledge of the metric were significant when the "up to 70% median speeders" were removed.

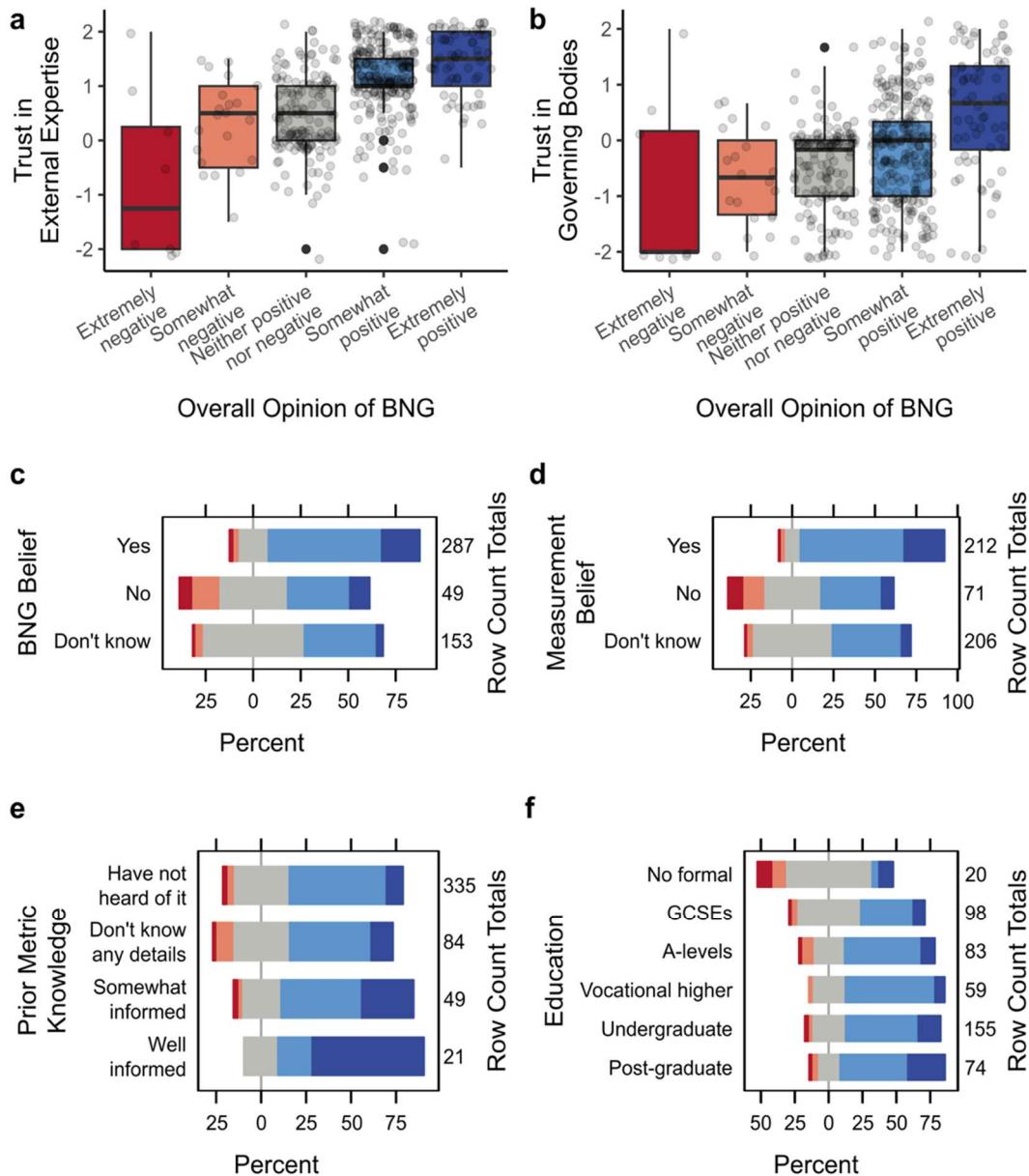


Figure 11: All factors that significantly predict overall opinion: (a) trust in external expertise; (b) trust in governing bodies; (c) whether the respondent believed it is possible to create a net gain in biodiversity after a loss due to development; (d) whether the respondent believed it is possible to measure biodiversity using a standardised numeric metric; (e) the respondent's existing knowledge of the Metric; and (f) the respondent's level of education. Across all panels, overall opinion is shown using colour and position, from very negative in dark red on the left to very positive in dark blue on the right.

The importance of the assumptions underpinning BNG in determining respondents' overall opinions of BNG was not unexpected as, if a respondent

does not believe it is possible to create a net gain after a loss due to development, nor that it can be quantified with a standardised numeric metric, then they are much less likely to be confident it will have a positive outcome. There were, however, a small minority of respondents who did not believe in the assumptions underpinning BNG yet had positive opinions of it as an approach to the environment. Although it is only a small sample, this may reflect the cognitive dissonance within neoliberal nature conservation, with the steps needed to 'net' nature seen as both impossible and inevitable (Anantharajah & Evans, 2024), resulting in some stakeholders accepting BNG even where they do not agree with the underlying principles.

Trust and accountability in BNG are particularly important for acceptance as the loss of biodiversity is, in most cases, certain but the gain relies on proper implementation (Rampling et al., 2024), so it is also not surprising that trust in actors involved in BNG was important in predicting overall opinion. Where stakeholders do not trust actors to do the right thing, as I have found is the case for developers and landowners within BNG, trust in the surrounding governance structures becomes more important as you don't need to trust someone if you trust the person holding them accountable (Chapter Two). This likely explains the presence of trust in governing bodies as an important factor in determining overall opinion of BNG and the relative unimportance of trust in the developers and private landowners themselves, although it is important to note that the two were highly correlated.

The lack of trust in both developers and private landowners and the governing bodies meant to hold them accountable potentially explains the importance of trust in external expertise in determining overall opinion of BNG, as they are likely being seen as the last accountability structure protecting the interests of nature. To ensure the effect that trust in external expertise had on overall opinion was not due to it measuring some aspect of intrinsic trust, I re-ran the model including average trust across all actors and residual trust for each actor group; residual trust in external expertise remained significant and thus I determined it was a genuine effect (Appendix 3D.2). More detailed research is

required to truly unpick this relationship but it is clear that trust is an important element in the acceptance of BNG. Building trust is difficult and requires repeatedly making and keeping promises, as well as showing that you are acting in the interest of people and nature (Chapter Two). This, however, takes time and in the short term it is likely that developers will need to publicly involve and listen to the trusted actors. but make sure not to delegitimise them by involving them in problematic projects.

4.4.5 What is the public's desired approach to BNG?

Respondents showed a preference for compensation to be provided through a mixture of habitat creation, enhancement and restoration (62.2%), followed by providing compensation through restoration and enhancement of existing habitats (29.4%), providing compensation solely by creating new habitats was the least popular option (7.2%) (Figure 12a). Six respondents gave “Other” responses to their preferred compensation approach, primarily expressing uncertainty. This may reflect a feeling that I need to look after what we already have, or a distrust in the ecological success of habitat creation, however, more research is required to gain a deeper understanding of desired approaches to compensation and biodiversity losses that may trigger rejection.

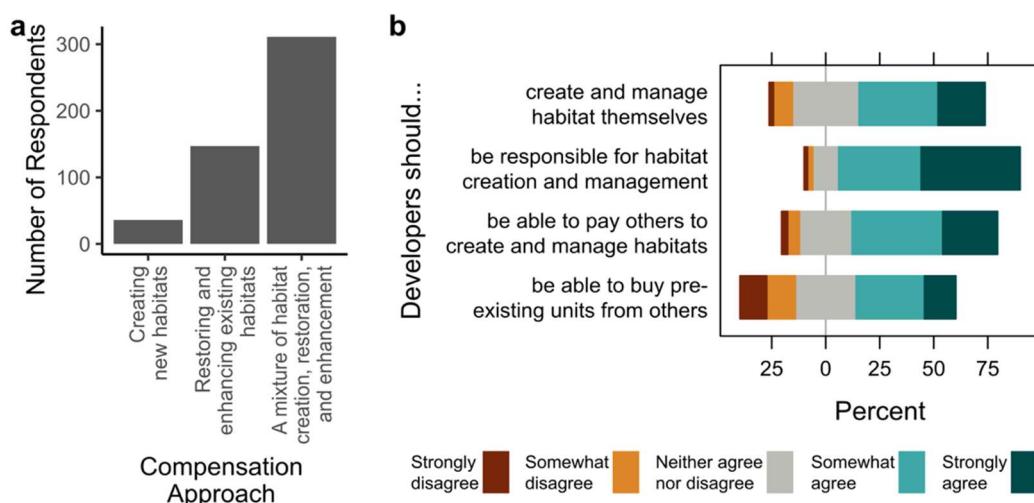


Figure 12: Respondents' preferences for the approach to compensation (a) and agreement with different options for developer responsibilities within BNG (b).

Respondents agreed that developers should be responsible for the creation and management of habitat (Figure 12b: 84% agree, 4% disagree), indicating a desire for BNG to follow the “polluter-restores”, as opposed to the “polluter-pays”, principle (see e.g., Damiens et al., 2021). Following this, respondents were much less positive about developers being able to buy pre-existing units from others (Figure 12b: 46.2% agree, 25.6% disagree), reflecting the recent controversy around the use of carbon credits (e.g. Greenfield, 2023). Whether developers should create and manage habitats themselves (Figure 12b: 58.4% agree, 10.8% disagree) or be able to pay others to create and manage habitat for them (Figure 12b: 67.4% agree, 8.2% disagree) was less clearcut, with respondents tending to agree with both statements. There was no significant correlation in respondents’ levels of agreement with whether “developers should be responsible for habitat creation and management” and whether “developers should be able to buy pre-existing units”. There was a moderate positive correlation between agreement with whether “developers should create and manage habitats themselves” and whether “developers should be responsible for habitat creation” and management. Agreement with all other pairs of statements showed a weak positive correlation.

4.5 Conclusions

The public's knowledge of Biodiversity Net Gain (BNG) is generally limited, with only 21% of respondents reporting some form of experience with BNG projects. Even among those who had experience, understanding of key components such as the BNG metric was minimal and, due to the tendency for respondents to over-estimate their own knowledge, both of these values are likely to be an overestimate. This suggests that the public has a low baseline of knowledge about BNG, which could influence their ability to critically evaluate BNG initiatives and policies.

Most respondents believed the assumption that it is possible to create a net gain in biodiversity by creating, restoring and enhancing habitat after a

development causes biodiversity loss. Fewer respondents believed the assumption that it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric, with a significant portion unsure. However, belief in the second assumption was higher in respondents who had read extra text describing the metric, suggesting the lower acceptance may be due to not having a concept of how the measurement of biodiversity might be made.

Trust in organizations involved in BNG was generally low, particularly for developers and government bodies, with the exception of wildlife charities and ecological consultants, who were viewed as more trustworthy. This trust disparity is critical, as the public's confidence in the entities responsible for implementing and overseeing BNG efforts directly impacts their acceptance of such initiatives.

Overall, the public holds a generally positive view of BNG as an approach, with only 6.4% of respondents having a negative view of BNG as an approach to the environment and over half responding that a project's environmental impact is acceptable if it achieves BNG. Key predictors of this positive opinion include trust in external expertise (wildlife charities and ecological consultants), belief in the assumptions underlying BNG, and existing knowledge of the BNG metric. This suggests that increasing trust in the organizations involved and improving public knowledge could enhance public support for BNG.

The public expressed a clear preference for a mixed approach to compensatory habitat creation, favouring a combination of habitat creation, restoration, and enhancement over purely creating new habitats. There was also strong agreement that developers should be responsible for the creation and management of compensatory habitats, with many opposing the idea of developers purchasing pre-existing biodiversity units. This indicates a desire for accountability and direct involvement from developers in managing biodiversity impacts.

While the English public supports the general concept of BNG, limited knowledge, low trust in developers and governing bodies, and use of pre-existing biodiversity units could pose challenges to the broader acceptance of BNG projects. My results suggest that key strategies to increase support include providing understandable information about how BNG works, involving trusted organizations, and ensuring developers take a more active role in biodiversity management. These, however, do not address fundamental criticisms of the metric and treating biodiversity as 'placeless,' meaning more research is required to understand how BNG may impact opinions on specific projects.

This chapter finds the English public generally agree with BNG as an approach in principle. In doing so, I provide a benchmark against which opinions of BNG can be compared for the remainder of this thesis. The results of this chapter suggest that BNG, at least as an idea, has a relatively high level of legitimacy with the English public, with most respondents sharing a positive opinion of BNG as an approach to the environment and believing it would improve nature in England. They also begin to reveal potential causes of the controversy surrounding BNG. For some, there is a lack of cognitive legitimacy-almost 10% of respondents did not believe it is possible to create a net gain in biodiversity after a loss due to development and almost 15% did not believe it is possible to measure and compare biodiversity using a standardised numeric metric. There was also a consistent lack of trust in most actors involved in BNG, except for those providing external expertise, meaning that, based on the SLO conceptualisation from Chapter Two, actors may struggle to be seen as acting legitimately even when using methods stakeholders would otherwise agree with. Finally, many respondents expressed strong views around how BNG should be carried out, namely that developers should be responsible for compensation and not buy pre-existing units from others. This reflects the findings from the previous chapter that there is a strong underlying view that BNG is a good idea, but more dispute around the specifics of how it should be implemented. In the next chapter, I build on this preliminary picture of how

BNG may impact SLO by analysing responses to the 2018-19 Defra consultation on net gain to better understand what stakeholders wanted to see from BNG in the early stages of policy development as well as potential issues they anticipated.

4.6 Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used ChatGPT 4.0 to improve the readability of the abstract and conclusions. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Chapter 5 Investigating the Acceptance of Biodiversity Net Gain Using Government Consultation Responses

5.1 Abstract

In response to the escalating ecological crisis, governments worldwide are increasingly adopting “net-outcome” policies, such as biodiversity net gain (BNG), which have previously been found to increase acceptance of environmentally harmful industries. The UK government has recently mandated BNG in England promising “win-win” outcomes for nature, development, and communities. However, BNG’s precursor, biodiversity offsetting, faced significant controversy in England, which, if replicated for BNG, may pose operational risks for developers following BNG legislation. To investigate this, I analyse individual and organizational responses to the UK Government’s 2018-19 consultation on proposed mandatory net gain. My findings reveal that while the introduction of mandatory BNG had broad support, there remain profound value conflicts that threaten its acceptance and are unresolvable within the current policy framework. This poses a risk for organisations implementing BNG, as the anticipated “win-win” outcomes may often prove unachievable, and the universally accepted approach to BNG may not emerge. Considering this, organisations must genuinely engage with the communities they wish to achieve acceptance from and be transparent and open about the values that are being prioritised within their approach to BNG.

5.2 Introduction

It is neither socially desirable nor politically feasible to avoid all development with an impact on biodiversity, for example the UN Sustainable Development Goals (SDG) call for development of infrastructure networks (SDG 9) and continued global economic growth (SDG 8) (Bull et al., 2020; Bull & Milner-Gulland, 2020; Hickel, 2019; Spaiser et al., 2017). Without further intervention, the development required to meet such socioeconomic goals is incompatible with achieving ecological targets (Hickel, 2019; Spaiser et al., 2017). It is generally accepted that, to reduce the environmental impacts of development, one should follow the mitigation hierarchy, which seeks first to avoid unnecessary development, then to minimise or restore adverse impacts, and finally to offset any adverse impacts that could not be avoided (Phalan et al., 2018). However, at best this maintains our present biodiversity crisis and typically, given avoidance is often not achieved (Cares et al., 2023), allows for continued incremental biodiversity loss (Bond et al., 2021; Bull et al., 2020).

In an attempt to reconcile development and nature, governments and organisations are increasingly adopting net-outcome style biodiversity policies, which aim to protect or enhance biodiversity while allowing continued development (Griffiths et al., 2019; zu Ermgassen et al., 2021). However, achieving this has proved elusive, with very few offsets successfully compensating for the loss of biodiversity where development occurs (zu Ermgassen et al., 2019). One example of the difficulties faced in designing a policy to reconcile development and conservation is the abandoned attempt to establish a formal biodiversity offsetting (BDO) programme in England in the early 2010s (Defra, 2013a, p. 8). The desire for ‘win-win’ solutions and deregulation created substantial tensions between the government’s desire for austerity and reduced regulatory burden for business on the one hand and the well-resourced and interventionist policy required to gain support and deliver meaningful conservation outcomes on the other (Lockhart, 2015). Further, the technocratic promise of providing an objective measure of biodiversity’s true

value proved out of reach, with disagreements over what should be measured; trade-offs related to the level of complexity of any measurement tools used; and the desire for a functioning market necessitating the abstraction of values to achieve the required level of fungibility (Lockhart, 2015). Furthermore, as opposed to providing a genuine source of agreement, projects voluntarily using offsetting approaches often ‘resolved’ controversy through technical depoliticization, moving the discussion to whether calculations were correct as opposed to whether what the project was doing was appropriate (e.g. Apostolopoulou, 2020).

Biodiversity net gain (BNG) goes a step further than BDO, promising additional compensation above what is required to offset the development’s impacts and the potential for economic development activities to contribute to positive biodiversity outcomes (Bull et al., 2020). BNG was proposed in England after, *inter alia*, industry pressure to ‘level the playing field’ with a standardised and measurable biodiversity requirement (Chapter Three) and subsequently mandated through the Environment Act 2021, requiring the majority of terrestrial developments to demonstrate a 10% increase in biodiversity value, calculated using a standardised numeric metric (Defra, 2022a). BNG in England is widely recognised as the most wide-reaching net-outcome style policy globally (zu Ermgassen et al., 2021). However, BNG shares many of the issues that beset BDO (Condon, 2020; Knight-Lenihan, 2020), including the contrasting expectations that it “will not prevent, delay or reduce housebuilding”, alongside “deliver[ing] habitat creation and/or enhancement” and being “of clear benefit to people and local communities” (all quotes Regulatory Policy Committee, 2019b, p. 1).

Despite the substantial similarity between BNG and BDO in methods and framing, mandating BNG received a much better reception (78% for mandate; Defra, 2019) than the equivalent consultation for BDO (53% for legislation; Defra, 2016). This suggests BNG may have the potential to deliver on the Government’s hope that “reassured by a robust biodiversity net gain policy, local communities could be more confident in accepting development” (Defra,

2018a, p. 2). However, BNG is not without controversy, as has been seen through public objections to multiple high-profile projects using BNG as an approach to environmental compensation in England (e.g., the Norwich Western Link road development (BBC, 2022; Grimmer, 2019a), and Sizewell C nuclear power plant (Earth, 2020; ITV News, 2022)), calling the acceptance of BNG into question.

Given BNG is now mandatory, uncertainty around the acceptance of BNG as an approach to addressing biodiversity impacts poses a problem for developers as unexpected negative public opinion can result in significant costs and delays, in some cases halting projects altogether (Hanna et al., 2016). Understanding the issues and concerns that impact the acceptance of BNG is thus essential to design acceptable approaches to addressing biodiversity impacts under mandatory BNG, thus increasing legitimacy and reducing operational risk (Saenz, 2021). I therefore conduct a thematic analysis of individual and available organisational responses to the 2018-19 Department for Environment, Food & Rural Affairs (Defra) (the Government department with responsibility for nature) consultation on Net Gain, an early consultation aiming to understand opinions of BNG prior to its mandate and thus a rich source of evidence, focussing on the concerns and issues raised about mandating BNG.

5.3 Methods

5.3.1 The 2018-19 Defra consultation on Net Gain

Seeking views on whether BNG should be introduced as a mandatory requirement, Defra ran a public consultation, open for responses between the 2nd of December 2018 to the 10th of February 2019 (Defra, 2021). This consultation, and the documents published alongside it, introduced the Government's proposed approach to BNG and represented the first step towards BNG legislation (Chapter Three). The pdf consultation document was 52 pages long (Defra, 2018a), and most responses were made through Defra's online consultation portal (Defra, 2021). A 33-page policy impact assessment

(Regulatory Policy Committee, 2018) was published contemporaneously with the consultation document as supporting information. The document emphasised the Government’s ‘win-win’ expectation for using BNG as a means of securing positive outcomes for the environment; improving the process for developers; delivering benefits for development, including greater certainty and process cost savings; and creating better places for local communities.

The consultation comprised 45 questions, with a mix of multiple choice and open free-text answers, covering:

- The proposed scope of BNG policy, including proposals for exempting house extensions, permitted developments, and potentially brownfield sites; a simplified process for small developments; flexibility to reflect important local features; the use of the district level licencing approach to address species impacts; and ambitions for wider environmental net gain.
- How biodiversity should be measured, including the area-based Defra biodiversity metric as a means of measuring and comparing biodiversity; the suggested 10% increase in biodiversity as the required level of gain; and whether developers should be able to pay through the tariff (discussed below) without fully exhausting on-site and local compensation opportunities; whether compensation should follow the “spatial hierarchy” such that distant habitat compensation is generally more expensive than habitats delivered on-site or locally; how assessments can be made more robust without increasing burden on developers and local planning authorities; and whether a national baseline of habitats should be developed.
- The delivery of biodiversity outcomes, including how compensation should be prioritised; the use of a market of biodiversity units and how this could be stimulated; a suggested duration of protection for compensatory habitats of 25-30 years; and how compensation should be secured, including the use of conservation covenants.

- How the tariff, a proposed option for developers to be able to pay a cash tariff where a development was unable to mitigate biodiversity loss on site or purchase the required biodiversity units locally, should be calculated, collected, and spent.
- How net gain should be delivered within the planning system such that impacts on local planning authorities and developers are minimised.

5.3.2 Collecting responses

The online Defra consultation was open to anyone, or any organisation with access to the internet that felt motivated to comment. An initial attempt was made to acquire all 470 consultation responses from Defra through an Environmental Information Request (EIR) (EIR2021/28831) however, this was denied as “it would take well in excess of 117 hours (assuming an average of 15 mins to review each response) to review and consider the information requested” (Appendix 4A.1, p. 2) and thus not be in the public interest to provide this information. I determined that, as this research focusses on acceptance and protest, which is often done by individuals, gathering a complete sample of individual responses through EIR was a priority. Before beginning the consultation, respondents were asked to state the sector and organisation they represent, with an option for those responding as individuals (“None, I am responding as an individual”, 61 responses). As such, I submitted a second EIR (detailed in section 2.2.1) to access the individual responses and limited my analysis of organisational responses to those publicly available and accessible on the internet (section 2.2.2).

5.3.2.1 *Individual responses*

All 61 individual responses to the Defra consultation were acquired through an Environmental Information Request (EIR) (EIR2022/01226) submitted to Defra on January 18th, 2022, and responded to on February 11th, 2022; the full EIR response is included in Appendix 4A.2. This represents a complete sample of

the individual consultation responses received by Defra through an open survey.

Freedom of information (FOI) requests, of which EIRs are a subset, and related legislation is increasingly being used in research, and the ethics of obtaining information by these means has been deemed acceptable (Savage & Hyde, 2014; Walby & Larsen, 2012; Wilson, 2011). The use of these data was reviewed by the University of East Anglia Faculty of Science Research Ethics Subcommittee (Ethics application ETH2122-2240). The data were anonymised by Defra before receipt by the authors meaning that although there was no identifiable information, the respondents could not be notified of, or consent to, this particular use of their data, a common issue with digitally collected data (Buchanan & Zimmer, 2021; Christensen & Larsen, 2020). However, respondents were informed about the possibility and consented to their data being acquired through an EIR request on responding to the original Defra consultation (Defra, 2018a, p. 8). Quotes from consultation responses are used as a primary means of verifying the validity of the themes to ensure respondents' views are represented as accurately as possible.

5.3.2.2 Organisational responses

Organisational responses were obtained using the full list of organisations that responded to the consultation published in the government summary of responses to the consultation (Defra, 2019 Annex A), a summary of which is shown in Appendix 4B, Table 4B.1. This list contained 354 organisation names, which is 55 fewer than would be expected if all non-individual responses were included (the authors are unsure of why this discrepancy is present in the government's presentation of the data, it may be that some organisations submitted multiple responses, or that organisations could choose for their names to be excluded from the appendix). Responses from planning authorities and non-ministerial Government departments were excluded because of their positions arbitrating BNG and in case they included biases contingent on the closer relationships of these bodies with the Government

attempting to implement the BNG policy, leaving 232 responses. I searched for the responses from each of the included organisations using Google between September 2021 and July 2022 using the search term:

"[ORGANISATION NAME]" AND (defra OR "net gain") AND (response OR consultation)

The first two pages of Google search results were inspected for the organisations' responses, and any responses from organisations other than the target returned by the search were also recorded. In total, 25 relevant responses were found, detailed in Table 4B.1 (Appendix 4B). This means organisational responses have gone through two rounds of convenience sampling (meaning that responses that are simply available, rather than having been selected based on attempts to be representative, were analysed), both in terms of the organisations volunteering to respond to the consultation and then having made their responses available online when the search was carried out. To assess the bias within my sample of organisational responses, I assigned each organisation to their relevant sector using, *inter alia*, their Companies House listings and compared to the expected number of responses for each sector (calculated from Figure 1 of Defra, 2019). My sample has a disproportionately high proportion of conservation organisations and very few Ecological consultants (see Appendix 4B for comparison).

5.3.2 Analysis

To assess reasons respondents thought BNG should not be mandated, I analysed responses to the first consultation question "Should biodiversity net gain be mandated for all housing, commercial and other development within the scope of the Town and County Planning Act?" (Defra, 2018a, p. 26). Subsequently, answers to open-ended questions in the consultation, excluding those on district level licencing and environmental net gain, were analysed using a thematic analysis as set out in (Braun & Clarke, 2006). Coding was undertaken using NVivo; following the definition of codes set out by Boyatzis

(1998, p. 63) as “the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon”. The codes then went through an iterative process of recombination to result in the final themes and sub-themes shown here. This differs from the original Government consultation summary, which was unclear on the approach taken to synthesise the results other than aggregating views in relation to specific questions asked. Further, using an inductive approach to raw consultation responses can find nuances and values that were not relevant to the Government’s aims for the consultation exercise. My analysis is therefore designed to re-evaluate the same data set using a different frame of analysis.

5.4 Results

The majority (75.5%; Figure 13) of respondents in my sample thought that BNG should be mandated for all housing, commercial and other development within the scope of the Town and County Planning Act, this was higher in individuals (83.6%) than organisations (56.0%). The reasons given by the five respondents who answered “no” and fifteen who gave caveated answers, could be categorised into five themes: BNG should not be used because it does not work (2 individuals); BNG should not be mandated, instead compensation should be judged on a case-by-case basis (1 organisation: NFU); BNG should not be mandated until certain conditions are met (3 organisations: Energy UK, Historic England, Friends of the Lake District); neutral about the mandating of BNG (1 organisation: UKELA); or finally that BNG should be mandated, but with certain caveats (7 individuals, 6 organisations).

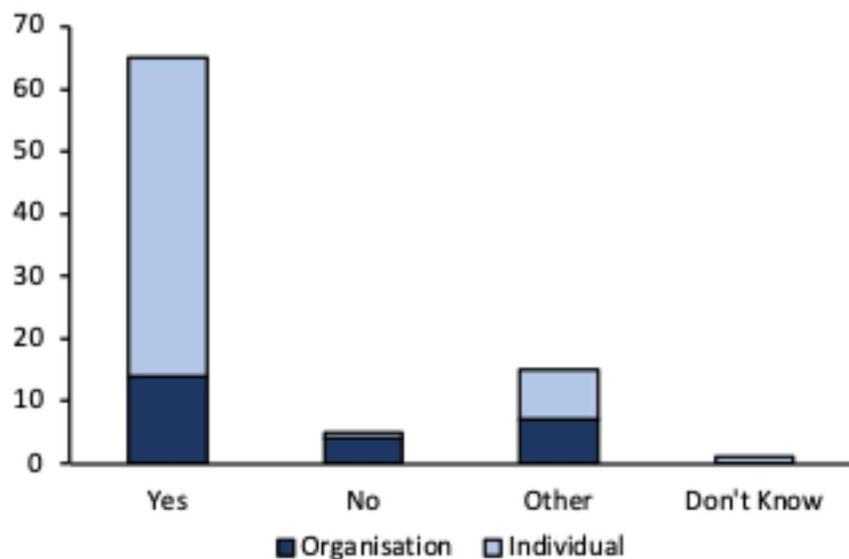


Figure 13: Respondents' answers to the question "Should biodiversity net gain be mandated for all housing, commercial and other development within the scope of the Town and County Planning Act?" (question 1 of the 2018 Defra consultation) split by whether they are an organisation or individual.

The thematic analysis of consultation responses was carried out at two levels. At the lower level, sub-themes were derived based on interpretation of text for individual issues. The higher-level themes were developed for aggregations of sub-themes dealing with similar issue. Wherever possible, sub-themes have been described using direct quotes from respondents, the context for which has been included in Appendix 4C. All quotes are attributed using organisation names or abbreviations for organisational respondents (see Appendix 4B, Table 4B.1) or "IR" followed by the individual respondent number (corresponding to the responses included in Appendix 4A.2) for individual respondents. Table 8 indicates the thematic structure developed through the analysis, for which the individual components are justified below.

Table 8: Thematic categorisation of stakeholder concerns about proposed BNG legislation in England.

Themes	Sub-themes
	Replaceability of habitat

Concerns about assumptions underpinning BNG	Ability to measure and compare biodiversity losses and gains
	Creation of and approach to compensation
Concerns about motivation for BNG	Focus should be on nature, not development
	BNG must follow the mitigation hierarchy
	Nature should not be an economic opportunity
Conflict regarding what BNG should prioritise	Pragmatism vs comprehensiveness
	Access vs disturbance
	Local needs vs national strategy
	Flexibility vs standardisation
Variable trust in actors involved in BNG	Trust in developers
	Trust in local authorities
	Trust in Natural England
	Trust in wildlife charities
Need for accountability structures	External accountability structures
	Accountability during implementation

5.4.1 Concerns about assumptions underpinning BNG

Biodiversity net gain relies on the assumptions that the lost habitat is replaceable and that it is possible to both measure biodiversity losses and provide gains of greater magnitude to achieve a ‘net gain’. The validity of these assumptions was not accepted by all survey respondents.

5.4.1.1 Replaceability of habitat

For many respondents, there was a feeling that “[n]o amount of compensation brings back a habitat capable of supporting the biodiversity currently supported”

(IR20). Views around the irreplaceability of biodiversity were often related back to ideas around the uniqueness of habitats, where “*biodiversity is a function of so many things: soil type and quality, aspect, slope, shelter, etc.*” (IR50), and evolutionary history resulting in “*irreplaceable habitats that have taken hundreds of years to evolve*” (IR20), meaning “*there is no money that can make up for destroying the unique habitat from that greenfield in that precise place in the UK. You cannot put it back. Ever. You cannot ever replace the lost biodiversity*” (IR35).

For some (particularly ecology and conservation) organisations, specific examples of irreplaceable habitats were given “*for example Ancient Semi-Natural Woodland and long-standing peat habitats*” (British Ecological Society) and it was noted that “*irreplaceable habitats must be outside the scope of the metric*” (CIEEM) “*as their loss cannot be mitigated or compensated for*” (Friends of the Lake District). Multiple individual and organisational respondents raised concerns that “[*t*]here must be no weakening of the protections of designated sites or loss of irreplaceable habitats” (Bat Conservation Trust).

For individual respondents, the split between ‘replaceable’ and ‘irreplaceable’ habitats was more often made along the line of brownfield and greenfield habitats, although it is hard to know whether their definitions of these habitat types align with those used in planning. One respondent called to “*PUT THE DEVELOPMENT ON THE BROWNFIELD SITE. It's so much simpler*” (IR35). Where “*brownfield sites can be enhanced by biodiversity net gain[...]*”, opinions about BNG were often much more favourable: “[...]*the planet gains twice - extra provision for wildlife, plus avoidance of destruction of irreplaceable habitats that have taken hundreds of years to evolve*” (IR20). However, it is important to note that multiple other respondents, both individual and organisational, saw brownfield habitats as being important for biodiversity, with one going so far as to say “[*b*]rownfield sites are some of the most biodiverse in the country at present” (IR47), although none referred to them as irreplaceable.

5.4.1.2 Ability to measure and compare biodiversity losses and gains

Many respondents were concerned that the losses would not be measured adequately and so in some way would be underestimated relative to the supposed value of their compensation, leading to a net loss. The reasons for this varied from inability to capture the full value: “[Y]ou can't put a number on wildlife – it undervalues it and doesn't take into account the cultural significance of being able to visit a wildlife rich area. [I]t provides a statistic that can be manipulated by developers for their gain and wildlife losses” (IR34); to complaints about Defra's metric, including the idea that “there will inevitably be some subjectivity involved in the metric” (RTPI) and that it “disproportionately incentivises offsetting through easier to produce habitats” (CIWEM). For other respondents, both individual and organisational, the lack of consideration of species was a concern. For some, this was an issue of biodiversity accounting: “[n]et gain cannot always be commensurate with loss of a rare species such as the nightingale or barn owl” (IR48) and as the “Defra metric does not cover species and therefore we consider that it is not fit for this purpose. Biodiversity net gain should not be implemented until this has been rectified” (Bat Conservation Trust). However, for others, the greater issue was the “suffering from the destruction by the animals whose habitat it is!” (IR32).

5.4.1.3 Creation of and approach to compensation

There was some concern over whether the gains claimed by a project would be genuine contributions to conservation, summarised by a feeling that “[r]eplacement habitat must be genuinely new or the potential for exceptional biodiversity increase be demonstrable” (IR6). For one respondent, this was deemed impossible, stating that “[y]ou cannot create extra biodiversity on 'new land' in a fantasy place far far away” (IR35). In some cases, the concern was that “[t]here is a risk that this policy will prevent habitat improvement outside of net gain delivery, with the policy itself acting as a deterrent to wider environmental improvements” (NFU), this was deemed unacceptable and that “[p]roviding for

biodiversity net gain and meeting these other obligations is not an either/or situation: both must continue to be delivered” (Friends of the Lake District).

There were further concerns about the success of attempted compensation, given the “*uncertainties in ensuring implementation and, even if schemes are implemented perfectly, in achieving long-term success*” (UKELA). This was compounded by the lack of evidence that biodiversity net gain works as an approach, with one respondent stating “[w]e are unaware of any studies demonstrating either net-gain or no-net-loss from national offsetting or net gain programmes, in contrast to numerous studies demonstrating net-losses of biodiversity” and that “[t]here is no evidence however that this process is either safe, successful or sustainable in the long term” (IR1).

5.4.2 Concerns about motivation for BNG

In the consultation, Defra state that “[t]he government will only mandate biodiversity net gain [sic] if it is satisfied that it will deliver benefits for development” (Defra, 2018a, p. 10). Although this was met with some support within organisational respondents, particularly those involved with development, the primary response from individuals and conservation organisations was that this missed the point of BNG being put in place to protect the environment.

5.4.2.1 *Focus should be on nature, not development*

Many respondents, both individual and organisational, pointed out that “[i]n a country where so much biodiversity has been lost to development over the past 40 years, it is only right that something is done about it” (Friends of the Lake District) and, as such, “the Net Gain scheme has to have environmental improvement at its centre, and not a desire to make things easier for developers” (IR6), and “[t]his should not be about streamline [sic] planning processes. This should be about protecting our fragile environments from development. There is far too much emphasis on development at the expense of the environment” (IR1). There was a recognition that “[t]he process is likely

to increase the burden on LPAs and developers. However, this should not be taken as a reason not to pursue it" (CIEEM). For many, the costs associated with the policy were seen as necessary - "[i]t is not a burden and if it is seen as such then the actions, motives and morals of those involved needs to [be] questioned" (IR51). The need to reduce the costs associated with the policy concerned many, with one respondent expressing that "reducing the burden for developers and planning authorities has it [sic] costs to the wildlife habitat" (IR2); this trade-off between burden and benefit will be discussed further in Section 5.4.3.1.

Counter to the view that BNG should not actively aim to make things easier for developers, a small number of respondents, all of which were organisations, "welcome[s] the intention to use the Biodiversity Net Gain (BNG) principle as a tool to streamline decision-making in the planning process" (Energy UK), and felt that "[n]et gain should not slow down the planning process for applicants or LPAs making planning decisions" (NFU). One respondent stated that "[d]evelopers should be able to locate, negotiate and invest in local offsetting in a low cost manner" (Anglian Water).

Where respondents expressed a preference for where the resources required for BNG would come from, they tended to feel that "it seems right that developers should bear most of the costs" (IR10) as "they're the ones taking home the money therefore they should pay!" (IR34). This feeling was shared by others who felt that the BNG process should "[u]se experts like ecologist[s] and wildlife trust[s] at the expense of developers - they are making the monry [sic] from desecrating the sites" (IR32). However, some respondents expressed that "Central Government should not expect to pass on the entre [sic] burden of delivering mandatory BNG to local authorities and developers" and that "[t]he extra burden of cost should be government subsidized" (IR13).

5.4.2.2 BNG should not undermine the mitigation hierarchy

Multiple respondents argued that “[u]nder no circumstances should compensation be used to justify the granting of permission for developments that would not (on the basis of their impacts) be otherwise permitted to proceed” (IR55). Application of the mitigation hierarchy was specifically highlighted as being critical to the protection of biodiversity: “[b]iodiversity net gain will only be successful with the proper application of the mitigation hierarchy and strong protection of non-designated sites” (Anglian Water). The most important thing for many respondents was to see the protection of already existing habitat – “[t]he biggest net gain would be to protect the diverse habitats that we already have - our woodlands, green fields, green belts, heathlands, rivers and meadows” (IR20).

There was also concern that the “tariff system [...] takes us away from a mitigation hierarchy approach towards a “pay to develop” approach” (IR55) and that we “do not want a regime that allows serious environmental damage as long as compensation is paid” (CPRE Sussex). As such there was a feeling that the use of the tariff should be minimised and “that any market system is the absolute last resort, after genuinely and meaningfully embedding the mitigation hierarchy into the planning system” (Friends of the Lake District). Price was seen as one way to facilitate this, with one respondent seeing the tariff as “[a] pragmatic solution to unlock some potential planning blight. But it must be more painful to the developer to support distant habitats in order to incentivise local gains wherever possible” (IR40). Others agreed it would need to be expensive but were somewhat less positive about the concept - “[i]f you can avoid protecting and promoting biodiversity by “paying a tariff” it would need to be a “significant” payment. After all, it’s only extinction of species as the true cost!” (IR15).

5.4.2.3 Nature should not be an economic opportunity

For many, the idea of people profiting from biodiversity units was unacceptable - “THE GROWTH OF A MARKET FOR BIODIVERSITY UNITS???? Is there nothing that Economic Ambition doesn't bounce into? I am gobsmacked” (IR35), “the very concept of a ‘market’ in biodiversity is almost offensive and should be abandoned” (IR6). This was due to both the potential for abuse, which will be discussed further in Section 5.4.4, and an inherent objection to the commodification of nature. Markets were seen by many as an “easy way out and could cause abuse of habitats and species. Wildlife should not be used as a commercial product” (IR59) which “ignores that each component of biodiversity is unique” (Friends of the Lake District).

As part of this, there was concern over the consultation’s suggestion that effort should be made to grow the biodiversity market – “*Mandating growth of a market is not the required outcome not building on sensitive sites is*” (IR14). A small number of organisational respondents were positive about the market, for example saying that “[t]he government should put in place mechanisms that support the development of a biodiversity offsetting market to facilitate the procurement of offsets as and when they are needed” (Anglian Water).

5.4.3 Conflict regarding what BNG should prioritise

There were multiple points of conflict within and between responses as to what should be prioritised when designing and applying BNG. Some of these, such as pragmatism vs comprehensiveness, follow the tension between nature and development discussed in Section 5.4.2. Others, such as access to nature vs undisturbed sites, represent conflict over how the benefits should be distributed.

5.4.3.1 Pragmatism vs comprehensiveness

“The planning process should be no more burdensome or expensive than is necessary, but it should be as strenuous and exhaustive as required to safeguard

those things which have been identified as public benefits of particular value, especially if they are irreplaceable" (Ancient Tree Forum).

Multiple individual and organisational respondents expressed that "the biological diversity of a site cannot fully be represented in a single value and encouraging comparison of single values to reduce the time it takes to process planning applications risks the loss of distinct and important habitats" (CIWEM), with some adding that "[i]t appears [the metric's] aim is to make life simpler for developers" (IR17), following the attitudes discussed in Section 5.4.1.1. Building on this, many expressed the opinion that if a metric is to be used, it "would need to be able to articulate losses and gains down to a species level, not just present a net change in biodiversity" (Friends of the Lake District). This contrasted with the views of many industry and planning respondents, who felt "[i]t is essential that the Defra metric and associated requirements are easy to apply and interpret" (RTPI) while "recognis[ing] the limitations of such a tool and use it accordingly" (CIEEM).

Views on the proposed value of 10% for the required amount of gain varied, a "minority [of members of the Environmental Industries Commission Taskforce] had the view it is too high and could be a point of contention with developers" (EIC), to the view that "10% isn't even enough to offset recent decline! it need [sic] to be more like 100% to even start going in the right direction" (IR34). Within both organisational and individual responses, the most common view was that "[t]he aim should be sufficiently ambitious to make a meaningful difference" (IR29) meaning "that a higher [than 10%] threshold should be set" (IR10), however, one individual stated that "[w]hilst ideally it should be more [than 10%], there has to be a balance between conflicting needs of development and nature" (IR52).

Many, particularly conservation organisations and individual respondents felt that "[t]o the extent that losses from development are permanent, any gains should also be permanent" (IR55) "[o]therwise there will be a rolling programme of losses of previously secured sites with a long term severe risk of

ongoing net loss" (Bat Conservation Trust). Others felt that "true permanence is illusory, but in order to ensure the effectiveness of the system in protecting biodiversity it is vital that any gains are protected for as long as possible" (IR53). For some organisational respondents, it was felt that "[f]ixed terms of 25-50 years may be far easier to agree than longer terms or agreements for management in perpetuity" (CIWEM). For these respondents, shorter fixed terms were felt to "be long enough for habitats to have developed to such a state that they are delivering the required benefit, but short enough to help stimulate a properly working offsetting market" (Anglian Water) and that "often once land use has existed for such a period it becomes entrenched and endures" (CIWEM).

There was also some concern that "sites with poor viability, such as rural exemption sites providing 100% affordable housing, may not be able to meet the demands of this policy" (National Parks England), with some recommending reducing the burden for such situations through exemptions, simplified assessments, or the use of the tariff in such situations, reflecting a form of flexibility as discussed in 3.3.4.

5.4.3.2 Access vs disturbance

Multiple individual and organisational respondents pointed out that "*[t]he social aspects of net gain must be addressed to ensure the people factor of biodiversity is adequately considered*" (Open Spaces Society). Many expressed the importance of providing access to compensatory biodiversity created for BNG, for example through creating "*new bus routes to reach new wildlife sites*" (IR48) and locating the compensation close to the loss, "*ensuring that there is a community benefit to local people so that people have access to natural green space*" (Bat Conservation Trust); "*[m]ix wildlife and people - nature is good for health & people might learn to respect & encourage wildlife*" (IR36). Others, however, highlighted that "*[u]ndue disturbance of a habitat can significantly reduce its function and overall value to wildlife*" (National Parks England) and that "*[a]reas created to meet biodiversity net gain requirements must be*

managed for biodiversity benefit not to meet recreation needs which would be considered under a wider environmental net gain approach" (CIWEM). The majority of respondents who discussed these issues felt some form of compromise was appropriate, with sites "[p]roviding public access as far as is possible without damage to wildlife" (IR48) but ensuring "multifunctional sites should only be used as part of compensation and net gain where this is appropriate ecologically" (Devon LNP).

5.4.3.3 Local needs vs national strategy

The majority of individual respondents, as well as a number of organisational respondents, were strongly in favour of compensatory habitat primarily, or only, being located locally to the compensation site – "*[i]t is difficult to see what other approach - than one that seeks to ensure that distant habitat creation is generally more expensive than delivering habitats on site or locally - would deliver the stated desiderata (in terms of benefiting local communities directly affected by new development, maintaining local habitat connectivity, etc)" (IR3), with one respondent going as far as to say "[i]f this [onsite or local provision] cannot be achieved the development should be refused" (Friends of the Lake District). This was primarily discussed "as it is closer to the people affected by development, and many of the costs are incurred locally" (ALERC) and "communities should share in the benefits of development" (Anglian Water). On top of this, there was a worry that "*a developer in a high-land-cost area would seek replacement habitat in a lower-cost area" (IR6) which "runs the risk of creating biodiversity hot spots[...]" and "[...]would certainly see net loss for species conservation" (Bat Conservation Trust).**

A smaller number of, primarily organisational, respondents "*question[ed] the assumption that biodiversity units should always be delivered on site as a first option" (Devon LNP). The reasons behind this differed, with some discussing the issues presented in Section 5.4.2.2 "[i]n many cases future urban effects will cause degradation of new habitats and it would be far better ecologically to create some habitats elsewhere (whilst ensuring that landscape connectivity is*

maintained around the site as required e.g. for bats, dormice etc)" (Devon LNP). Others felt that "in some cases investment in the local wildlife/habitat may not give good returns for effort and expense" (IR48) and that "[t]argeting should be areas of greatest need or opportunity" (IR10) "prioritis[ing] habitat restoration or creation in locations that increase ecological connectivity and ecosystem resilience" (British Ecological Society). For others still, the issue was more about distributive justice, where off-site spending could "help to address social inequalities by targeting spend on areas which have a green space deficiency and/or high levels of deprivation, but where little new development is expected" (RTPI).

Views on the extent to which BNG should contribute to a national strategy differed between respondents. No respondents suggested a purely strategic view, but a minority of respondents recognised the contextual drivers that might lead to more distant habitat provision, particularly "*[i]n situations where there are distant opportunities which are considerably greater than the sum of mediocre or short lived on-site or local measures*" (IR5). As such, it was suggested by multiple respondents that "*[a] Biodiversity Net Gain scheme must be led by a national plan as part of a wider strategic view of spatial planning for the delivery of nature improvements and natural capital*" (Ancient Tree Forum). One respondent, however, pointed out that "*[i]t is important not to unwittingly facilitate the destruction of local habitats through valuing national scale networks more highly*" (CIWEM).

5.4.3.4 Flexibility vs standardisation

A number of individual and organisational respondents highlighted the importance of flexibility in ensuring BNG delivers effective outcomes, as "*you can't assess all habitat types and locations equally as they are not equal from the outset*" (IR34) and "*[t]o imply a "one size fits all" approach risks jeopardising local buy in and is contrary to the concept of Community based approaches*" (IR31). "*New rules should act as a minimum and allow flexibility for reasonable adjustments*" (CIWEM) to "*ensur[e] that the delivery of net gain in biodiversity*

is characteristic of the local area and makes a meaningful contribution to the landscape” (Local Nature Partnerships), “[a]s long as any such adjustments were weighted in favour of increasing the biodiversity net gain and NOT reducing it !!” (IR45). For some respondents, flexibility was seen to aid balancing pragmatism and comprehensiveness (see Section 5.4.3.1).

The view that flexibility was to be desired was not universal. It was felt by many that standardisation, both in terms of not having exemptions and having a “*simple metric with few opportunities for subjectivity / argument*” (Devon LNP) was essential because “*because as soon as you have any exceptions there will be a loophole so that developers can avoid having to do anything*” (IR35), “*NO development should be allowed without a net biodiversity gain*” (IR17) and “[a]ny simplified biodiversity assessment process would simply weaken the case for mandatory biodiversity net gain and would be a fudge” (IR1). Further, many felt standardisation would be a “*useful step in developing a simpler, more efficient assessment process*” (CIWEM), allowing developers to “*know exactly what is required without a complex system of exemptions or exclusions*” (Hampshire Swifts) and “*ensur[ing] data can be collected and shared in same way for all projects*” (ALERC). Within this discussion, the conflict between pragmatism and comprehensiveness (Section 5.4.3.1) remained important: “*in improving efficiency we must not sacrifice functionality; assessments must be fit for the purpose of delivering biodiversity net gain*” (CIWEM).

5.4.4 Variable trust in actors involved in BNG

The consultation responses revealed variable trust in different BNG actors to deliver BNG appropriately. This complicates the extent to which BNG is perceived to be able to work.

5.4.4.1 *Trust in developers*

Within individual respondents, there was a strong feeling that “[t]oo often developers put down the bare minimum of biodiversity enhancements or choose sites that destroy valuable biodiversity and other environmental assets”

(IR39). This resulted in the concern that the policy may be “used by developers as a way to skirt round the regulations and develop an environmentally sensitive site” (IR1) and that “[a]ny loophole or shortcut would be exploited by unscrupulous developers” (IR29), with a “serious risk is that there will be an incentive to manipulate the system and for developers to artificially minimise or maximise biodiversity values for financial gain” (IR53).

5.4.4.2 Trust in local authorities

Many individual and organisational respondents had “significant concerns about whether local authorities have the skills, knowledge, resources and capacity to support and deliver mandatory biodiversity net gain” (IEMA). “The capacity and resources of Local Authorities to conduct or verify robust ecological assessments are a significant concern” (UKGBC) leading them to “inadvertently facilitat[e] the activities of developers by being inadequately funded to properly manage the planning process” (Hampshire Swifts). A small number of individual and organisational respondents also shared the concern that “planning authorities [...] may well have a vested interest” (CPRE Sussex) “[f]or example, local authority housing target pressures must not unduly encourage recourse to the tariff at the expense of the mitigation hierarchy” (UKGBC).

5.4.4.3 Trust in Natural England

Natural England is the arms-length environmental body in England and act as the government’s advisor for the natural environment (Natural England, 2025). A few respondents felt there was a “*similar situation [to local authorities] at Natural England*” (IR47), feeling the organisation “*is underfunded and no longer impartial and often not meeting its duties in terms of protecting the natural environment*” (CPRE Sussex).

5.4.4.4 Trust in wildlife charities

Wildlife charities were seen positively by many respondents as they were seen to be “objective and independent” (IR5) and “amongst the best at creating, enhancing and managing habitats, and the most keen to manage for biodiversity in perpetuity” (Devon LNP).

5.4.5 Need for accountability structures

The need for accountability manifests in two ways. Firstly, there is accountability related to the level of robustness of the specific requirements, for example, can requirements deliver the expected goals, and is sufficient authority given to enforce the policy? Secondly, there is accountability related to ensuring different actors go about implementing the policy as written.

5.4.5.1 External accountability structures

For many respondents, it was seen as the responsibility of those enacting the policy to “*Ensure that any scheme is robust and more importantly, is enforced*” (IR1), including reducing opportunities for misuse, particularly that “*all loopholes need to be seriously looked at*” (IR2), with some respondents going as far as to say “*planning permission should not be granted until the compensatory habitat is in place*” (IR29). Many respondents expressed the need for “[s]tandardisation of process across different localities” (ALERC), relating back to the arguments for standardisation in Section 5.4.3.4, including “[m]ore clarity in defining what is legitimate” (IR40) and ensuring “*that all the rules are simple and consistently applied*” (IR44). Across respondents, it was generally felt that “[g]uidance should be made available to developers, including the potential for new habitat provision and environmental enhancement” (IR6).

Documented commitments were discussed by many as a way to increase the robustness of the policy: “[e]very development should have a biodiversity net gain plan submitted as part of the applications process, authored by a certified independent assessor, and then an [sic] further “implemented as per plan” via a

post-completion survey, or even as part of final approval by, say, building regulations" (IR42). Multiple organisational respondents felt any BNG commitments "need to be clear how success is measured and, where there are potential failures, how these will be addressed" (NFU) to "enable businesses to report on progress towards achieving them" (Open Spaces Society). Many respondents also felt that "[n]et gains need to be recorded and mapped to ensure that sites are maintained for the prescribed duration" (CIEEM) and that there "[s]hould be land registers of net gain creation and enhancement sites" (IR37) which "could be published on a public register to allow stakeholders to check their performance" (British Ecological Society).

Many respondents felt that conservation covenants "could play a key role in making the theory of biodiversity net gain a practical option primarily by providing a mechanism to secure the compensation site over the long term" (Ancient Tree Forum). "Any such covenants should be fully transparent to the public and especially to the local communities involved" (IR6). Multiple individual and organisational respondents highlighted that "[f]unding required from developer to cover on-going maintenance - needs to be considered an integral part of a development or part of the tariff paid" (IR28), meaning "[c]onservation covenants will need to be accompanied by sufficient funds to deliver the intended aims" (Bat Conservation Trust). Some respondents, however, expressed that currently "planning covenants are so easily evaded as to be completely useless" (IR44) meaning that, if they are to work "[t]he courts need to take them seriously" (IR44).

One of the most discussed factors in ensuring projects achieved BNG was that "[a]dequate ongoing monitoring is essential" (IR6) and this "[k]nowledge must be transparent! We all need to know as quickly as possible where habitats are failing or improving" (IR50). "Unless created site [sic] are monitored and managed according to a robust schedule there is no hope that they will deliver increased biodiversity" (IR50). Many respondents expressed the importance of monitoring being carried out "by an appropriately independent body with the necessary legal/financial powers to enforce compliance" (CIEEM) including

“adequate sanctions against developers or others who fail to provide what is required of them, whether that be in the extent, quality and/or location of Net Gain habitat or aftercare” (IR6). Some respondents felt this required “[e]nsuring that LPAs have the necessary funding to implement – and more importantly, monitor and enforce – BNG” (CIEEM) “so their planning enforcement officers can assess where things have failed” (IR17). One suggested that “provision should be made in the legislation for local authorities to recover costs through planning charges” (CIWEM), alternatively, it was suggested that “[a] capped amount of all tariffs received, should be used to ensure the proper assessment, implementation and monitoring of all projects” (Ancient Tree Forum).

5.4.5.2 Accountability during implementation

Many individual and organisational respondents discussed the importance of ensuring the BNG assessments themselves are robust, “[t]he delivery and monitoring of BNG needs both ecologists and specialist groups on the ground instead of in an armchair” (IR59). Further to this, many respondents emphasised that “[i]n order for biodiversity assessments to have the credibility necessary for them to be both reliable for LPA planners and accepted by affected communities, it is crucial not only that they are carried out by experts in the ecological field but by specialists independent of the ‘development sector’” (IR3). Multiple respondents, mainly organisations, suggested “accreditation of undertakers of habitat assessment, particularly through professional bodies like the Chartered Institute of Ecology and Environmental Management (CIEEM)[...],” as a means of ensuring good practice during assessments as “[...] [t]he ability of professional bodies to hold their members to account is key to ensuring BNG potential is met” (Anglian Water). Others, particularly individuals, expressed that “[l]ocal knowledge and democratic engagement is vital to a robust assessment process” (IR53).

There was concern “that the planning authority and developers could come to an agreement to circumvent the rules proposed without public scrutiny.

Instead, there is a need for this process to be not only transparent but inclusive of local and conservation stakeholders" (IR55). The lack of trust in developers lead many to express "[t]hey [developers] need a total change of mindset when they start their planning process and to seek to work collaboratively with local planners, local communities and local environmental/wildlife NGOs" (IR39). Multiple respondents suggested developers should "utilise established, credible conservation partners to create and conserve habitats in perpetuity (for example RSPB, The Wildlife Trusts and the Woodland Trust)" (IEMA). A small number of respondents felt this included "[p]ublic participation in decision-making, monitoring and enforcement" (IR53). Other, mainly organisational respondents, "encourage offsetting providers to be able to be accredited so they can demonstrate their professional practice and provide assurance to developers" (Anglian Water) as "[a]ccreditation and enforcement are needed to safeguard against poor practices and ensure a market for quality, well managed, biodiversity units develops." (CIWEM).

5.5 Discussion

Within respondents to the Defra consultation, including my sample, there was a strong response that BNG should become mandatory due to an urgent need for accountability structured to support biodiversity and reduce the negative impact of development (Defra, 2019). Government consultation documents are long and potentially difficult to find without significant existing engagement and knowledge of where to look, therefore these responses will all come from relatively motivated individuals and organisations. Nonetheless, this broadly positive overall opinion of BNG as an approach to addressing biodiversity impacts does appear to be representative of the wider English public, of which 63.8% have a positive overall opinion of BNG and only 6.4% have a negative overall opinion (Chapter Three). However, an overall desire for BNG to be mandated does not guarantee that it will be accepted in practice; **my analysis** reveals substantial conflict in what BNG should aim to achieve, strongly

reflecting the tensions previously seen within BDO policy (Lockhart, 2015) and stemming from fundamental conflicts between the policies' desired objectives.

Throughout the development of BNG policy in England, an explicit aim has been to provide benefit to development, whether through streamlining the process to reduce burden, or increasing community acceptance of projects (Chapter Three). In contrast to this, my results indicate that, outside of stakeholders involved in development activities, the desire for BNG stems from wanting to put nature above development (Section 5.4.2.1) and have a means of holding developers accountable where they fail to respect nature (Section 5.4.5). In fact, the potential for BNG to facilitate development that may not otherwise be permitted without biodiversity compensation was seen by many as a disadvantage of the policy (Section 5.4.2.2) and the idea of a biodiversity market was a highly emotive issue (Section 5.4.2.3).

Perhaps most fundamentally, not all stakeholders believed the assumptions underlying BNG (Section 5.4.1). The fungibility and commensurability of biodiversity is an assumption fundamental to the “netting” of biodiversity, but is far from an absolute truth (see e.g. Sullivan & Hannis, 2015) and there is significant evidence that compensation often fails to achieve additional conservation outcomes (see e.g. zu Ermgassen et al., 2019). This means it cannot be assumed stakeholders will see (even well designed) compensation as making up for, let alone representing a gain compared to, any loss that occurred due to development.

Those who do not want BNG to have a negative impact on development, the government included, pushed for BNG to use methods that are pragmatic and easy to follow (Section 5.4.3.1; Chapter Three). This has resulted in a policy that, although of unprecedented scope (zu Ermgassen et al., 2021), uses the methods and requirements seen by many respondents to this consultation as insufficiently stringent and comprehensive to properly protect, yet alone enhance, biodiversity (Section 5.4.3.1). This conflict between the comprehensiveness and the pragmatism required for functioning markets and

easier integration into existing planning policy appears to be a fundamental feature of net outcome and offsetting-style policies, particularly with regard to surrogate measures of biodiversity (Maron et al., 2016).

Concerns about the comprehensiveness of BNG are further aggravated by governance gaps (or, less generously, “loopholes”) present in the current pragmatic approach to BNG (e.g. see Rampling et al., 2024 for discussion of governance gaps for on-site compensation). This lack of accountability (Section 5.4.5), combined with the lack of trust in some of the actors involved in BNG (Section 5.4.4), have the potential to undermine people’s belief that developers will carry through on their BNG commitments (Chapter Two). This is particularly relevant in the context of austerity and cuts to local planning authorities meaning they lack the resources and expertise to properly govern BNG (Section 5.4.4.1; Condon, 2020).

Biodiversity and nature have almost as many values as there are people to value it and much of this nuance is lost when a single number is required for comparison, no matter how complex the method used (Sullivan & Hannis, 2015). This, combined with the level of fungibility built into BNG to increase developers’ ability to find commensurate habitats, means developers can fulfil their BNG requirements in many ways and thus invites conflict as to what should be prioritised. Two such conflicts revolve around whether BNG should prioritise local needs or national strategy (Section 5.4.3.2) and the level of access that should be provided on compensatory sites (Section 5.4.3.3).

The policy prioritises on-site and local compensation through the spatial hierarchy, a view shared by most independent and charity respondents to ensure communities retain their access to nature, and industry as this is generally the cheapest approach. However, even assuming perfect compliance, on-site and highly local compensation performs relatively poorly for both biodiversity and people outside of those who interact with the development itself (Mancini et al., 2024), leading some respondents to suggest there are situations where more strategic off-site compensation is more appropriate.

Choosing off-site compensation brings with it a new set of problems as locations that perform well for biodiversity often perform poorly for people and vice versa (Mancini et al., 2024). Further, no matter where compensation is located, there is generally a trade-off between access to nature and wildlife disturbance (British Ecological Society, 2023) adding additional difficulty in creating “win-wins” for people and nature. In this situation it is difficult to see how any single strategy will promote widespread acceptance – what works for some may antagonise others.

All of this combines to create a difficult situation for developers now subject to BNG. The government’s reluctance to put in place regulation with the power to protect nature at the expense of development means that legal compliance does not guarantee acceptance. This is likely to have lasting and global relevance as to do so would go against the paradigmatic focus on economic growth and likely prove unpopular with powerful corporations (e.g. Fremstad & Paul, 2022; Hathaway, 2020). The trade-offs discussed here indicate that requiring a single policy to consistently benefit development, nature, and people is not realistic. It must be accepted that these ‘win-wins’ are not always possible, at least in England’s neoliberal policy context, and taking action to address the concerns of one group of stakeholders is likely to negatively impact acceptance from another group. As has long been discussed, these conflicts are inherently moral and political in nature and therefore are only masked, not solved, through increasingly technical approaches (see e.g. Apostolopoulou, 2020). Thus, acceptance of BNG as an approach to the environment is likely to require genuine discussion and engagement with communities, as opposed to relying on spreadsheet calculations. Organisations must base their plans on expertise, including that of the local communities, and make explicit the values and interests that are being prioritised within a specific project (Schmid, 2008) and recognise that, where these priorities prove unacceptable with the community of interest, the approach may have to be changed for acceptance to be achieved.

5.6 Conclusions

BNG policy in England has been designed with the multiple stated aims of benefitting biodiversity, people, and development. The policy is generally popular within the British public however, through analysing the 2018-19 Defra consultation on Net Gain, I find substantial conflicts that may reduce acceptance in practice. Perhaps most fundamentally, not everyone accepts BNG is possible to achieve and, even within those who do, the focus on providing benefit to development is seen as missing the point of a biodiversity policy. The multiple aims lead to conflicting priorities across methods and approaches. The pragmatic methods and requirements built into the policy combined with lack of trust in actors mean legal compliance with BNG is unlikely to satisfy all stakeholders that biodiversity is being adequately protected. Further, conflicting priorities as to what compensation should aim to achieve mean the desired 'win-win' across all aims is unlikely to be achievable in all cases. To address this, and its implications for operational risk, organisations should explicitly acknowledge the values and interests that are being prioritised within their approach to BNG and genuinely engage with the communities they seek acceptance from.

This chapter contributes a more in depth, qualitative, understanding of the predicted acceptance issues associated with BNG. Much like the previous chapter, I find a general desire for BNG as an idea to be brought forward, but conflict around exactly how this should be done. Through this, one can see that differing views of what BNG should set out to achieve appear to represent value conflicts, based around differing ideologies and world views on the extent to which development should be prioritised (or not) over currently standing biodiversity, as opposed to more easily fixed technical difficulties (cognitive as opposed to moral procedural legitimacy as introduced in Chapter Two). The events presented in Chapter Three show that these differing values resulted in tensions between the strength of protection for biodiversity and the ease of use for developers throughout the development of BNG policy. On top of this, and

in line with the SLO conceptualisation presented in Chapter Two, trust and accountability come out as key issues in a policy that requires the acceptance of certain losses in return for uncertain gains. Next, I use the learning from the chapters two to five to inform a questionnaire-based analysis of the Norwich Western Link road, a controversial proposed road project, to understand the extent to which these issues inform debates in practice and the potential impact on the SLO of projects using BNG as an approach.

Chapter 6 Did Biodiversity Net Gain Influence Social Licence to Operate? Evidence From a Controversial Road Proposal in England

6.1 Abstract

Biodiversity net gain (BNG) is often cited as a mechanism through which development and the need for nature conservation can be reconciled and is generally seen positively as an approach to the Environment by the English public. Despite this, multiple projects using BNG as their approach to the environment have been subject to controversy surrounding their negative environmental impacts, leading to a negative Social Licence to Operate (SLO) and creating uncertainty for developers. To increase our understanding of whether and how BNG influences SLO, I use a questionnaire to look at the Norwich Western Link (NWL), a controversial proposed road project in the East of England with a stated aim of achieving BNG for all applicable habitats. I find that SLO judgements surrounding the NWL are highly polarised, with this polarisation also seen in perceptions of the NWL's social and environmental impacts. While judgements of the NWL's plan to address biodiversity impacts were highly associated with project rejection, this appears to be mediated by confirmation bias and respondents' beliefs in whether BNG is possible. As most (80.5%) of those against the NWL do not believe BNG is possible, this new policy mechanism is unlikely to make their SLO judgements more positive. However, BNG does appear to be largely accepted by respondents not against the project and thus may act to strengthen already positive SLO judgements.

6.2 Introduction

In the face of an ecological crisis, there is an ongoing struggle to reconcile the desire for economic growth and development and the environmental harm it causes (Hickel, 2019; Spaiser et al., 2017). Organisations responsible for development are increasingly being expected to take responsibility for their environmental impacts in order to gain and maintain their social licence to operate (SLO) (e.g. Saenz, 2021), generally defined as the level of approval that an industry, organisation, or project realises from its stakeholders (Thomson & Boutilier, 2011), primarily focussing on civil society. Having a poor SLO can lead to protest (Jijelava & Vanclay, 2017), which can incur substantial costs and cause reputational damage (Franks et al., 2014). Thus, failing to address environmental externalities has a genuine potential to introduce operational risks. Net outcome approaches, which tie conservation to development by requiring that projects offset and compensate for biodiversity impacts such that they have neutral (no net loss/NNL) or positive (biodiversity net gain/BNG) biodiversity outcomes, are increasingly being put forward both by corporations (de Silva et al., 2019) and governments (Griffiths et al., 2019; zu Ermgassen et al., 2021).

The UK Government has recently introduced a wide-reaching net outcome policy in England, requiring that most terrestrial developments achieve at least a 10% biodiversity net gain as measured by a habitat-area-based metric (Chapter Three). This policy was introduced with the expectation that, as well as safeguarding nature, it would benefit development through increasing community acceptance and streamlining the planning process, requiring the policy to be as simple and usable as possible (Defra, 2018a). These contrasting aims have led to conflict between those who wanted the policy to provide comprehensive protection for nature and those who wanted it to be designed in a way to facilitate continued development (Chapters Three and Five). Further, the aim of facilitating development has also led to a 'licence to trash' narrative (de Zylva, 2018). Despite this, the policy appears to be generally accepted by the

English public, indicating it may succeed in its aim of reducing operational risk for developers (Chapter Four). However, gaps remain in our understanding of how BNG affects acceptance of proposed projects, which have tangible impacts, as previous work has focussed on the acceptance of BNG as a policy.

Social licence to operate (SLO) is one way of conceptualising acceptance, rejection, and the associated operational risk. SLO is a somewhat nebulous concept, resulting in considerable debate on what it is and how it can be measured (Jijelava & Vanclay, 2018; Moffat et al., 2016). However, it is widely agreed that, as opposed to the binary state suggested by the term 'licence', SLO is largely intangible (Bice et al., 2017; Franks & Cohen, 2012; Parsons & Moffat, 2014) and given by a multiplicity of stakeholders with different norms and expectations as opposed to a single 'community' (Dare et al., 2014).

To account for the conceptual difficulty of defining a single SLO, I follow the approach of (Chapter Two) of considering SLO at the level of individuals' judgements of whether they are against the project (or not). Within this conceptualisation, a simplified version of which is shown in Figure 14 individuals first form perceptions of a project/organisation(s)' properties (e.g., what the project will look like, potential impacts) and behaviours (e.g., methods and approaches) based on the information available to them (that they choose to engage with); they will then form a judgement on whether the project/organisation(s)' actions are legitimate (i.e., acceptable within the context) which, combined with whether they trust the organisation, will determine their SLO judgement. This conceptualisation allows information about whether the project engenders an SLO, and thus the likelihood of rejection from a range of stakeholders, to be elucidated without falsely assuming homogeneity or making disputed judgements around the extent of consensus required or whose views and interests should count (see e.g. Boutilier, 2014).

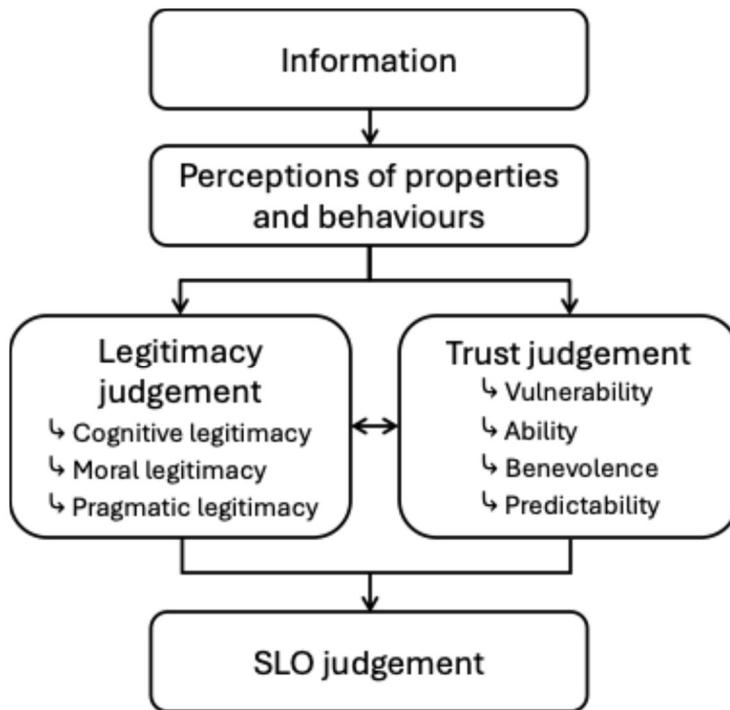


Figure 14: Conceptualisation of SLO used within this chapter, simplified from Chapter Two.

The Norwich Western Link (NWL) road located in the East of England is an example of a proposed project with environmental impacts that remained controversial despite a stated aim to achieve BNG for all applicable habitats. The NWL had a stated goal of increasing connectivity and reducing both traffic and the practice of driving through residential side streets to avoid congested main roads (rat-running) to the north-west of Norwich. If built, the road would have crossed the Wensum Valley, an ecologically sensitive area due to the presence of, *inter alia*, Barbastelle bats and ancient woodland. The river and some of the surrounding valley is a designated Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) along the River Wensum. As such, it is an appropriate case study to investigate the role of BNG in reconciling these social and environmental conflicts and the influence (if any) of the BNG on the SLO of the proposed NWL. I use questionnaire responses from local and/or interested people to answer the following questions:

- 1) Did the Norwich Western Link engender a social licence to operate?
 - a. What are respondents' perceptions of the NWL's impacts?
 - b. How do these perceptions relate to rejection of the NWL?
- 2) Did biodiversity net gain impact the social licence to operate of the Norwich Western Link?
 - a. How do respondents' perceptions of the plan to address biodiversity relate to rejection of the NWL?
 - b. Do respondents believe BNG is possible?
 - c. How does additional information on the impacts and methods to address biodiversity affect views of the NWL?

6.3 Methods

6.3.1 Norwich Western Link case study background

The River Wensum is one of two rivers running through Norwich and flows from the northwest of the city. The river has been designated a Site of Special Scientific Interest (SSSI), and both the river and areas of the surrounding Wensum Valley have been designated as a Special Area of Conservation (SAC) (Natural England, 2024), protected under the Conservation of Habitats and Species Regulations 2010. One of Norwich's main road connections is the A47, running from Birmingham to Lowestoft, which ran through the city until the Norwich southern bypass was completed in 1992 (Craske, 2022). After the completion of the southern bypass, the addition of a Northern Distributor Road (NDR) was included in a 2002/3 review of the Norwich Area Transportation Strategy (NATS) (Norfolk County Council, 2003) in the hope it would improve quality of life by reducing traffic, provide better links for businesses and employment, facilitate urban expansion, and improve access to the airport (Norfolk County Council, 2005 Appendix 3). This proved popular,

receiving support from 78% of respondents to the NATS consultation (Norfolk County Council, 2004, p. 2).

The consultation on the preferred route of the NDR received over 10,000 responses (for context, Norwich had a population of 125,600 at the time (Office for National Statistics, 2023)) but revealed no obvious choice of route for the western portion between the A47 (west) and the A1067 as the most popular routes closer to the city also had the most negative environmental impacts (Norfolk County Council, 2005 Appendices 1 and 8). Further, it was deemed that, for every route, building a dual carriageway would impact the integrity of the Wensum SAC resulting in a high chance the scheme would fail “due to being rejected by the Secretary of State on the advice of Statutory Environmental Bodies[...]" and potentially resulting in significantly increased costs due to “[...]dealing with protestors, adverse publicity, legal challenges and professional advisors advocating a case through a Public Inquiry” (Norfolk County Council, 2005, para. 6.5.6). As such, the council were faced with a choice between attempting to go ahead with the road people wanted, but with a high chance of failure; building the dual-carriageway route from the A47 (west) to the A1067 and completing the ring-road with a single carriageway following one of the less preferred outer routes proposed for the western portion (Figure 15; 2004 SC); or only building the partial route between the A47 (east) to the A1067, looking to pursue a separate scheme to address the issues in this area (Norfolk County Council, 2005, p. 22). The third option was chosen and construction started on the partial route, now known as the A1270 Broadland Northway, in January 2016 with the road fully opened to traffic in April 2018 (Norfolk County Council, 2024a).

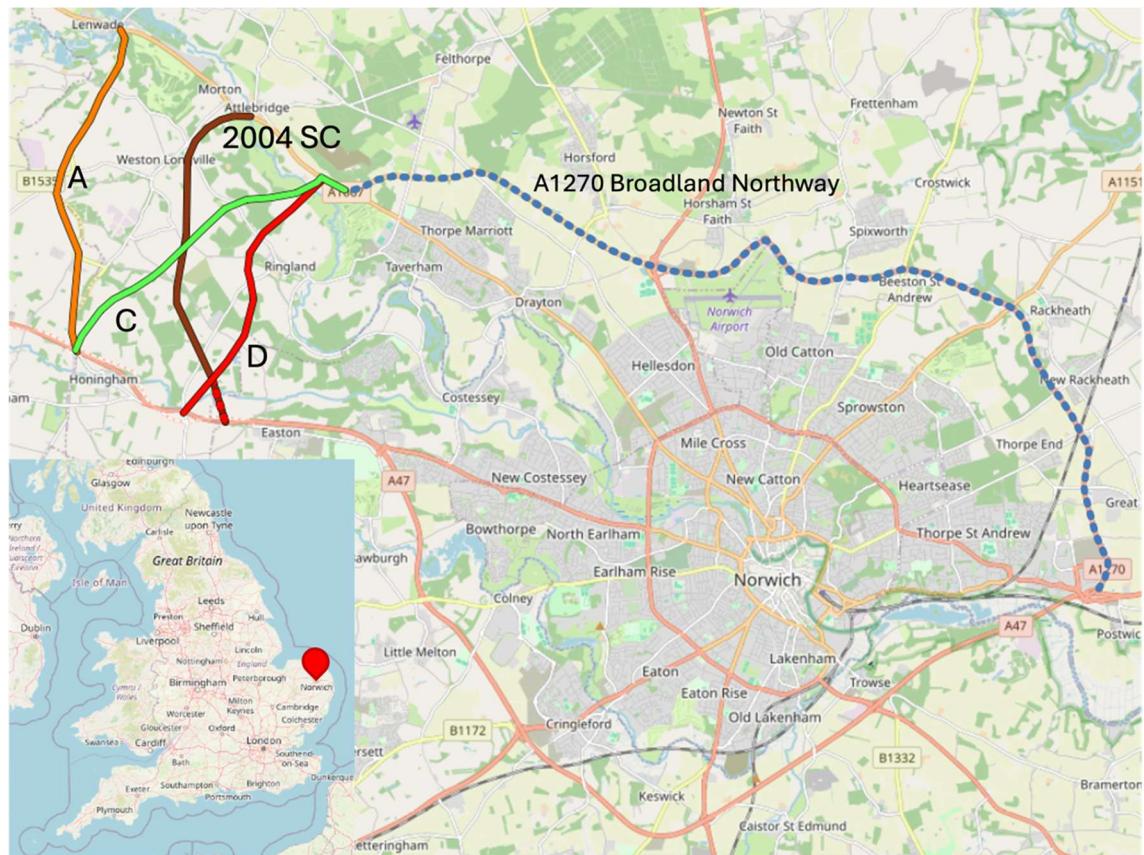


Figure 15: Map of proposed routes for the Norwich Western Link, also showing the A1270 Broadland Northway (blue dash) and map of Norwich's location in England (inset).

Routes shown are: the single carriageway route recommended as acceptable as part of the NDR (brown, 2004 SC); and routes A (orange), C (green), and D (red) of the route options assessed in 2019. Route C was chosen as the route for the NWL.

Attempts to fill this ‘missing link’ (which would later become known as the Norwich Western Link – the focus of this research) between the A47 (west) and A1067, began in 2014 (before the partial NDR route had been completed), with the commissioning of another scoping study which, in contrast to previous reports, recommended that only the routes closer to Norwich should be looked at further, despite them all requiring new crossings of the River Wensum SAC/SSSI (Mott MacDonald, 2014, p. 33). A subsequent technical report recommended that the impacts, and thus best solutions, in the area could not be properly understood until the completion of the Broadland Northway and other large projects in the area meaning the priority should be on “establishing a robust evidence base” (Mouchel, 2016, p. 63). Thus, in July 2016, the county

council put over £400,000 aside to explore the feasibility of a ‘Norwich Western Link’ (NWL) (EDT Committee, 2016) and later in December they committed to making this a priority (Norfolk County Council, 2021, p. 4).

The council’s commitment to the NWL was met with support from many organisations, including the Norfolk and Norwich University Hospital, Norfolk Constabulary, and local councils (WSP, 2021a, para. 2.11.3). However, there was also significant controversy around the project, leading to the creation of the ‘Stop the Wensum Link’ campaign in early 2017 (*Stop the Wensum Link | Facebook*, 2024). In 2018, Norfolk County Council ran two consultations to inform the decision on which route the NWL should take (see WSP, 2019a, 2019b), a selection of the proposed routes (A, C, and D) are shown in Figure 15. The work determined the western-most routes (A and B - the southern portion of C and broadly followed the northern portion of 2004 SC) to be environmentally worse than alternatives due to the impact on a known colony of protected Barbastelle bats. Again, the public’s preferred route (D) was closest to Norwich, however, route C, further west from the centre of Norwich was recommended on the basis of requiring, *inter alia*, less complex engineering and having smaller estimated impacts on ancient woodland and habitats of principle importance (Norfolk County Council, 2019, p. 27).

The route chosen for the NWL required a 720m viaduct over the River Wensum and had an estimated cost of £153m and construction start date in 2022 (Grimmer, 2019b). The planned route passed through or close to areas of floodplain grazing marsh, lowland mixed deciduous woodland, and wet woodland (WSP & Norfolk County Council, 2022); all of which are habitats of principal importance in England (Biodiversity Reporting and Information Group, 2007). These habitats fall within the Norwich Western Link’s biodiversity net gain target, and the compensation strategy includes the provision of new compensatory habitat, including the planting of new woodland, and enhancement of existing habitat (WSP & Norfolk County Council, 2022). At the time this work was done, and according to the environmental impact assessment, no direct impact on ancient woodland

would be expected, although the potential of impacting ancient woodland was not ruled out and the route would result in the loss of ancient and veteran trees (WSP & Norfolk County Council, 2022). Environmental and climate groups protested against the route chosen and, soon after, a petition calling for the road to be stopped was created; a Stop the Wensum Link petition started in 2019, and received 1,000 signatures in a month and over 18,500 as of early 2025 (Pett, 2025).

The years between 2019 and late 2023, when this research was undertaken, were characterised by delays, setbacks, increasing costs and further controversy. In 2020, a legally protected Barbastelle bat breeding colony was found on the intended route by an external consultant (Parkin, 2020). This, amongst other things, contributed to an increase in the expected cost of the NWL to £198m by 2021 (Grimmer, 2021b). Norfolk County Council submitted the outline business case for approval by the Department of Transport in June 2021 (WSP, 2021a), a year and a half after the original intended date of December 2019 (Grimmer, 2021a). The road then saw a further cost increase to £251m due to needing to alter the route to avoid the bats (Grimmer & Vickers, 2022). During this time, it remained a controversial issue, with a poll run by the local newspaper finding that a slight majority (51.4%) of respondents did not want the road to go ahead, 17.1% of whom had changed their opinion following the cost increase (Grimmer, 2022).

In October 2023, the government approved the outline business case for the NWL and assigned £213m, 85% of the estimated cost at that time (Grimmer, 2023), making the road seem more certain. This was the context within which this research was undertaken. In March 2024 the Council stated that they were “within weeks” of submitting the planning application (Grimmer, 2024a). These hopes, however, were dashed when Natural England, the statutory agency in England with responsibility for nature, confirmed that the project would be unlikely to be given the licence required given the likely disturbance to protected bat species (Grimmer, 2024b; Marshall, 2024). As of early 2025, the fate of the NWL remained uncertain (Grimmer, 2025), however, Norfolk

County Council withdrew the planning application on January 21st 2025, indicating the road going ahead in this form is unlikely, although it has been maintained as a priority project (Hakimian, 2025).

6.3.2 Data collection

The approach taken in this work was based on the conceptualisation of SLO explained above; an understanding of the factors that influence acceptance of BNG based on preliminary research by the authors (Chapter Five); and publicly available documents on the NWL. This work has been approved by the UEA Faculty of Science Research Ethics Subcommittee and University Research Ethics Committee (original application ID ETH2223-2179, latest amendment application ID ETH2324-2537).

6.2.2.1 *Data collection*

The questionnaire contained sections focussing on knowledge of and relationship to the NWL; impacts of the NWL; developer of the NWL (and plan to address biodiversity); potential of the respondent to act against the NWL; additional information about BNG; general views of BNG; additional information about the NWL and its approach to biodiversity; impacts of the additional information on opinions of the NWL; and demographic data. The full questionnaire is available in Appendix 5A. Where respondents stated they either had not heard of the NWL prior to this questionnaire (6 respondents) or had heard of it but did not know any details (42 respondents), they were hyperlinked to the page on additional information about BNG to avoid answering questions they would be unable to answer.

The questionnaire received a total of 637 responses. It was initially piloted using people with a range of views on the NWL within the authors' immediate circle (10 responses). After this, three sampling methods were used to gather responses from local people and those engaged with activist groups against the NWL. The first approach, which had a low response rate (32 responses), was to gather the views of local people through sharing the questionnaire via local

interest Facebook groups (having asked the administrators for permission). This was supplemented through the distributing of leaflets to houses in the vicinity of the NWL. Leaflets were distributed across seven postcode sectors surrounding the proposed NWL route, constituting 27,226 addresses using the Royal Mail 'Door 2 Door' service, the leaflet drop was booked for the two weeks beginning the 20th of November, but the responses from the leaflet campaign began arriving on 18th of November 2023 (see Figure 16 for map of leafleted postcodes and Appendix 5B for a copy of the leaflet details of distribution). A total of 496 responses stated they had found the questionnaire through the leaflets, indicating a response rate of at least 1.8%. To gather responses from those engaged with the activist groups against the NWL who may live outside the leafleted postcodes, I passed the questionnaire onto activist groups, namely Stop the Wensum Link and the Wensum Woodlanders, who shared it in their newsletters and on their social media; 52 responses can be directly attributed to this method. This was done after the leaflets had been distributed, to minimise the association of the questionnaire with the activist movement. A further 22 respondents found the questionnaire on social media, but it is unknown whether this was from activist or local interest Facebook groups. Finally, 25 responses came from other or unknown sources.

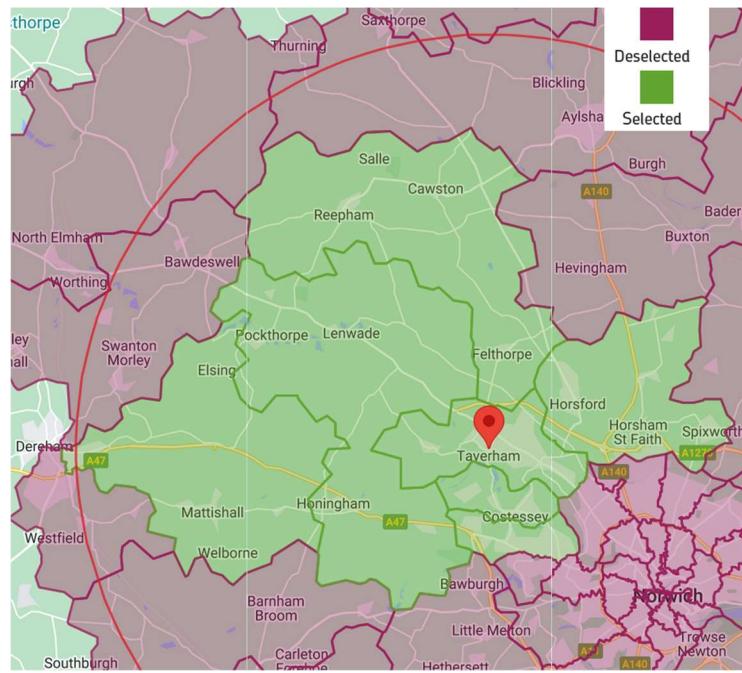


Figure 16: Map of postcode sectors chosen for leafletting. Selection was based on proximity to the proposed NWL route and cost of leafletting.

6.3.2.2 Did the NWL engender a SLO?

To answer the first research question “Does the Norwich Western Link engender a social licence to operate?”, I required two pieces of information:

- Respondents’ perceptions of the NWL’s impacts
 - overall to understand the strength of feeling (Q22: “What do you think the overall impact of the Norwich Western Link will be?” A: “Very negative”; “Somewhat negative”; “Neither positive nor negative”; “Somewhat positive”; “Very positive”).
 - specific impacts, chosen to capture both local vs national and social vs environmental aspects of impacts (Q21: “What do you think the impacts of the Norwich Western Link will be on: you personally / the local economy / local nature / biodiversity / national nature / the national economy / the climate” A: “Very negative” (-2); “Somewhat negative” (-1); “Neither positive nor negative” (0); “Somewhat positive” (1); “Very positive” (2); “Don’t know” (NA)).

- Respondents' SLO judgement, for which I used a binary measure of rejection, as against/not against is arguably the most relevant SLO delineation for organisations concerned about operational risk (Q32: "Are you against the Norwich Western Link being built?" A: "Yes" / "No" / "Don't know").

6.3.2.3 Did BNG impact the SLO of the NWL?

For the second research question "Does biodiversity net gain impact the social licence to operate of the Norwich Western Link?", as well as the above measure of SLO judgement, I used:

- Respondents' perceptions of the NWL's plan to address biodiversity, namely whether the respondent thought there was a plan in place (Q28: "To your knowledge, are there plans in place to try to address the impact of the Norwich Western Link on biodiversity?" A: "Yes" / "No" / "Don't know") and, for those who thought there was a plan in place, what the respondent thought of the methods (Q29: "What do you think of the methods the Norwich Western Link will use to address its impact on biodiversity?" A: "Best practice" / "Good" / "Adequate" / "Poor" / "Worst practice" / "Don't know").
 - the answers to these two questions were combined and simplified into the levels: "No plan" ("No" Q28) ; "Don't know if plan" ("Don't know" Q28); "Bad plan" ("Poor" / "Worst practice" to Q29); "Don't know plan quality" ("Don't know" to Q29); and "Adequate or better plan" ("Best practice" / "Good" / "Adequate" to Q29).
- Knowledge of BNG and the NWL, to understand whether differences in the perception of the plan to address biodiversity were based on a knowledge deficit, were estimated by asking:
 - how much of the text on each the respondent knew (Q42 and Q52, A: "All of the information" / "The majority of the information" /

“About half of the information” / “Some of the information” / “None of the information”); and

- the length of text they read (Q37, whether they chose to see the metric text or not for BNG; and Q47, whether they chose to see the shorter or more detailed information for the NWL).
- Whether respondents believed BNG is possible, to understand whether differences are based on fundamental views (Q43: “Do you believe it is possible to create a net gain in biodiversity after a development causes biodiversity loss through the creation and enhancement of habitat?” A: “Yes” / “No” / “Don’t know” / “Other”).
- Change in opinion based on the information on the NWL included in the questionnaire, measured as a Likert-type panel (Q53: “How has the information on the previous page changed your views on the following aspects of the Norwich Western Link? Impact on biodiversity / Methods used to address impact on biodiversity / Likelihood developers will meet biodiversity commitments / Overall view of Norwich Western Link” A: “Made my views much more negative” / “Made my views somewhat more negative” / “Has not changed my views” / “Made my views somewhat more positive” / “Made my views much more positive”).

6.4 Results

6.4.1 Did the Norwich Western Link engender a social licence to operate?

Across all respondents with prior knowledge of the NWL, 66.0% (389) were not against the NWL, 32.1% were against the NWL, and 1.9% (11) did not know if they were against the NWL. Views were highly polarised (Figure 17), with the most common perception of overall impacts being “Very positive” (49.9%) and the second most common being “Very negative” (23.9%). Respondents’ perceptions of the overall impact were highly associated with their SLO judgements (pairwise proportion test: $p < 0.0001$), such that 95.8% of

respondents who thought the impacts of the NWL would be somewhat or very negative were against the NWL compared to only 0.5% of those who thought the impacts would be somewhat or very positive. Rejection was significantly (pairwise proportion test: $p < 0.0001$) lower in respondents who stated they had found the questionnaire through the leaflet campaign (20.0% of 456) than those who stated they had found the questionnaire on social media (80.4% of 102).

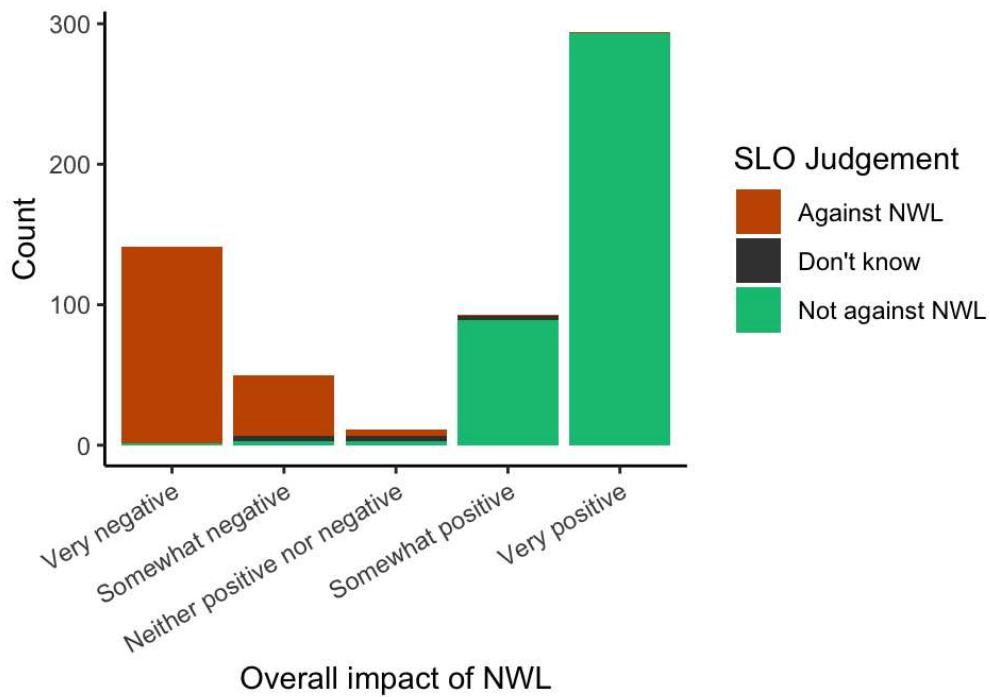


Figure 17: Respondents' perceptions of the overall impact of the NWL.

Figure 17 shows respondents' perceptions of eight specific impacts of the NWL. All impacts measured were highly positively correlated (see Supplementary Figure 5C.1 for pairwise polychoric correlation coefficients). Across all respondents (Figure 18a), there was generally a somewhat or very positive perception of the NWL's impact on themselves (59.1% positive, 26.4% negative), the community (63.0% positive, 27.8% negative), and the local (61.0% positive, 12.3% negative) and national (45.0% positive, 10.9% negative) economy. Perceptions of the impacts on biodiversity (13.3% positive, 47.7%

negative) and local (11.8% positive, 51.1% negative) and national (12.4% positive, 38.5% negative) nature were generally somewhat or very negative. Perceptions of the impact of the NWL of the climate were more evenly split (27.5% positive, 34.7% negative). These patterns were broadly replicated in respondents not against the NWL (Figure 18c), with a higher percentage of positive and lower percentage of negative perceptions across all impacts. This is in contrast to the perceived impacts of those against the NWL (Figure 18b), the majority of whom had negative perceptions of the impact on themselves (positive 4.8%, negative 74.1%) and the community (positive 7.9%, negative 80.0%) and none of whom thought there would be positive impacts on the climate, biodiversity, and local and national nature.

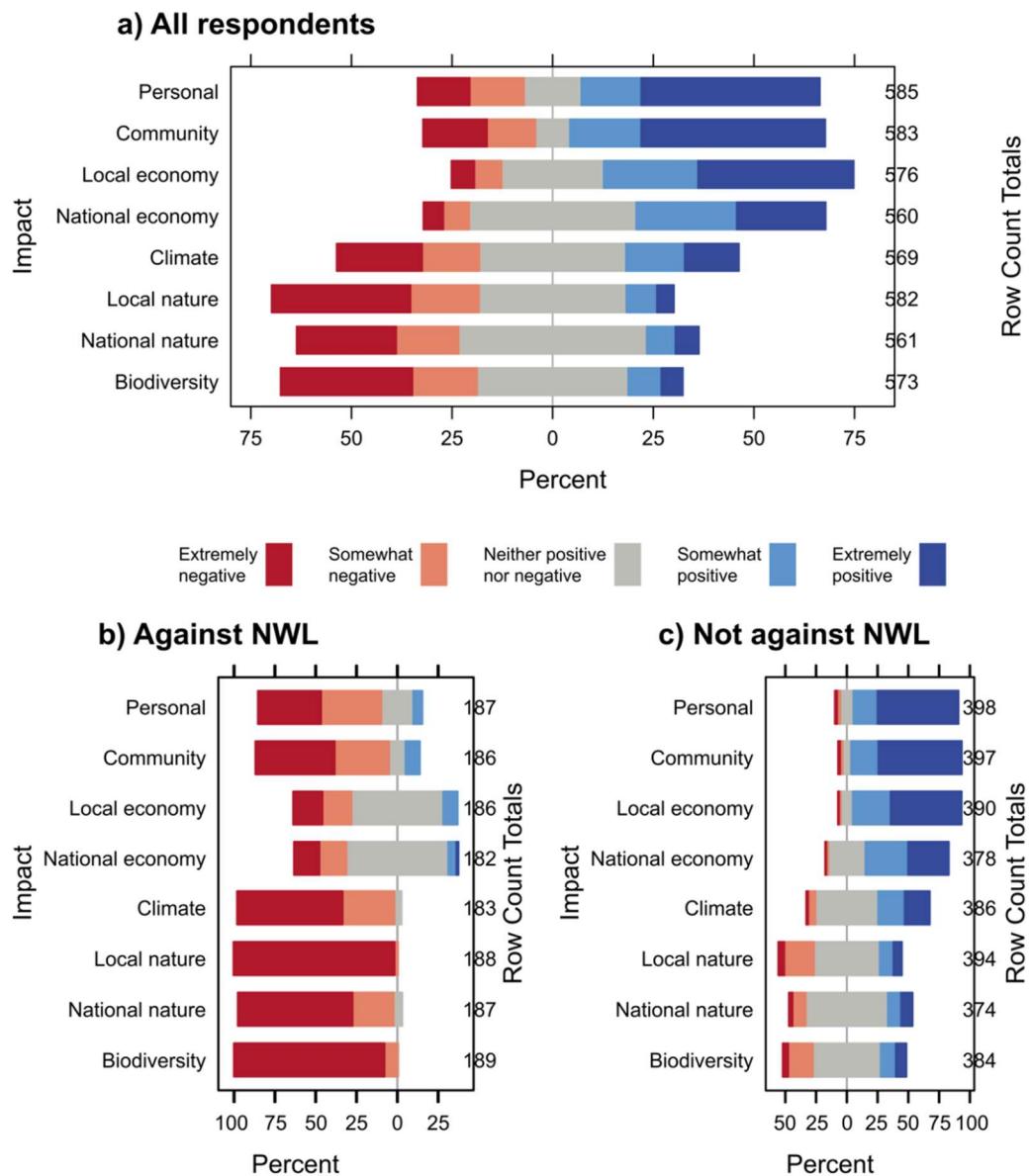


Figure 18: Respondents' perceptions of eight specific impacts of the NWL for (a) all respondents, (b) those who were against the NWL (b), and (c) those who were not against the NWL. "Don't know" responses are excluded from all panels, hence the difference in row count totals.

To understand how perceptions of the specific impacts of the NWL shown in Figure 18 contributed to their overall SLO judgement, an exploratory factor analysis was conducted (full method described in Appendix 5C). Based on this, the impacts were divided into two factors (Table 9): "Environmental impact", the unit-weighted mean of perceptions of impacts on biodiversity, local nature, national nature and the climate; and "Social impact", the unit-weighted mean

of perceptions of impacts on themselves (personal), community, local economy, and national economy. Perceptions of “Social impacts” were significantly more positive than those of “Environmental impacts” (medians 1 and -0.25 respectively; $W = 258418$, p -value < 0.0001). This pattern was also reflected in the number of respondents with positive (i.e., > 0) perceptions of the “Social impacts” (385 respondents, 65.6%) and “Environmental impacts” (156 respondents, 26.6%).

Table 9: Estimated loading of each impact onto the two factors obtained from exploratory factor analysis, bold values show the factor each impact has been assigned to in my analysis.

	“Environmental impact”	“Social impact”
Personal	0.38	0.56
Community	0.35	0.64
Local economy	0.02	0.94
National economy	0.12	0.75
Local nature	0.87	0.11
National nature	0.84	0.14
Biodiversity	0.90	0.09
Climate	0.61	0.33

Figure 19 shows the distribution of responses when the mean values of “Social impact” and “Environmental impact” are plotted against one another. The two factors were highly correlated ($r = 0.84$). Very few respondents (9 respondents, 1.5%) fall above the line $x = y$, meaning respondents perceptions of the NWL’s “Environmental impact” are very rarely more positive than their perceptions of “Social impact” to be positive. Also of note is the lack of respondents in the bottom right corner, indicating no-one who perceived the “Social impact” to be very positive perceived the “Environmental impact” to be very negative.

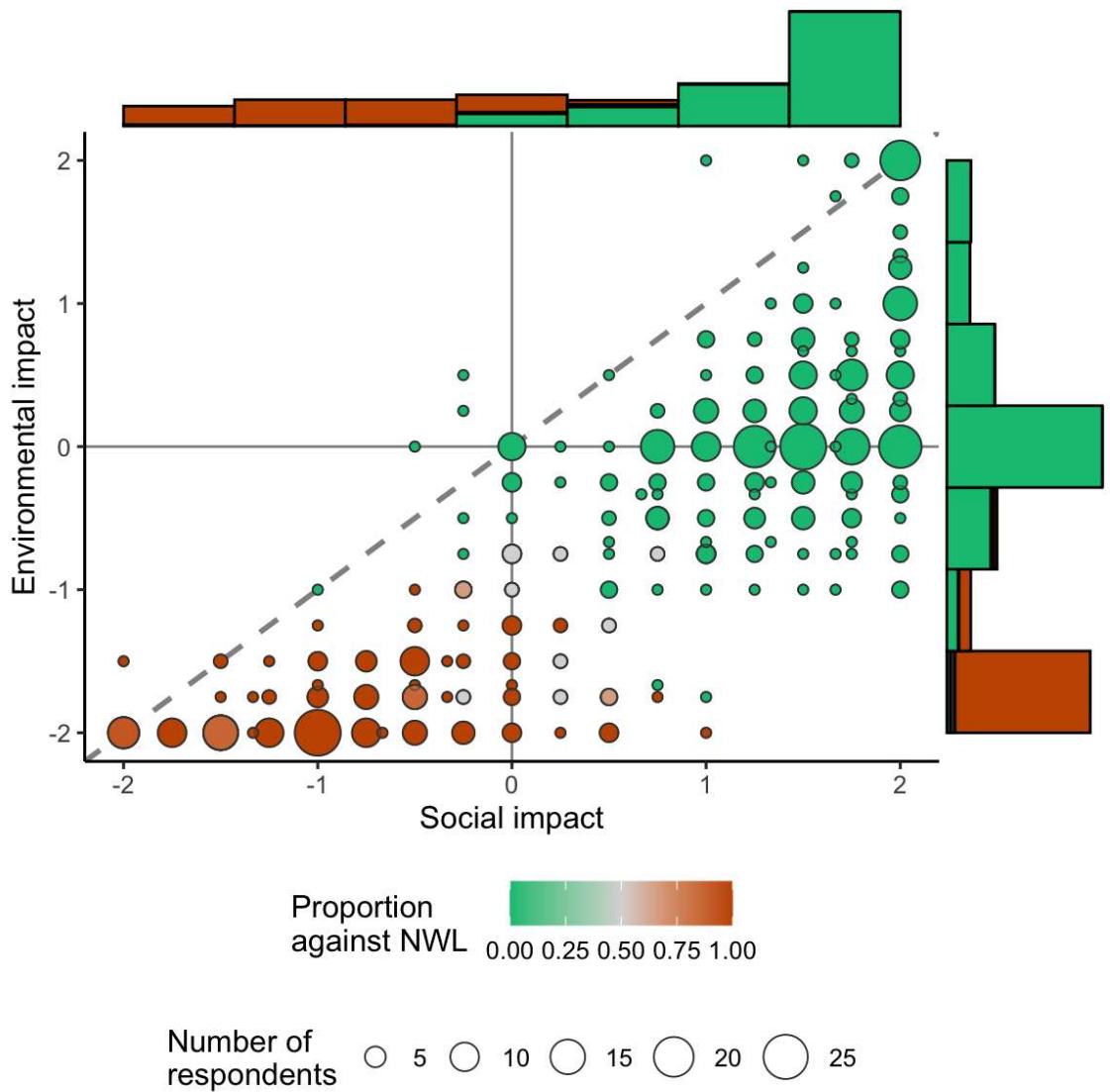


Figure 19: Respondents' perceptions of the "Social impact" (average of perceived personal, community, local economy and national economy impacts) and "Environmental impact" (average of perceived local nature, national nature, biodiversity, and climate impacts). Both measures range from -2 to 2, having been averaged from a five-point Likert response question with the options "very negative" (-2) / "somewhat negative" (-1) / "neither positive nor negative" (0) / somewhat positive (1) / "very positive" (2). As such, higher values indicate a more positive view of the impacts and 0 indicates some level of neutrality. Marginal plots show the frequencies of perceptions of each impact, with colour showing whether the respondent was against the NWL (darker red), not against the NWL (lighter green), or did not know if they were against the NWL (dark grey).

6.4.2 Does BNG impact the SLO of the NWL?

Respondents' judgements of the NWL's plan to address biodiversity impacts were significantly associated with whether they were against the road (Figure 20; $\chi^2 = 1030$, $df = 15$, $p\text{-value} < 0.0001$). Only 2.8% of people who thought there was an adequate or better plan in place were against the NWL compared to 90.4% of people who thought there was a bad plan and 83.3% who thought there was no plan. Furthermore, some respondents left comments suggesting they answered "no plan" as they believed any plans in place to be inadequate to address the biodiversity impacts.

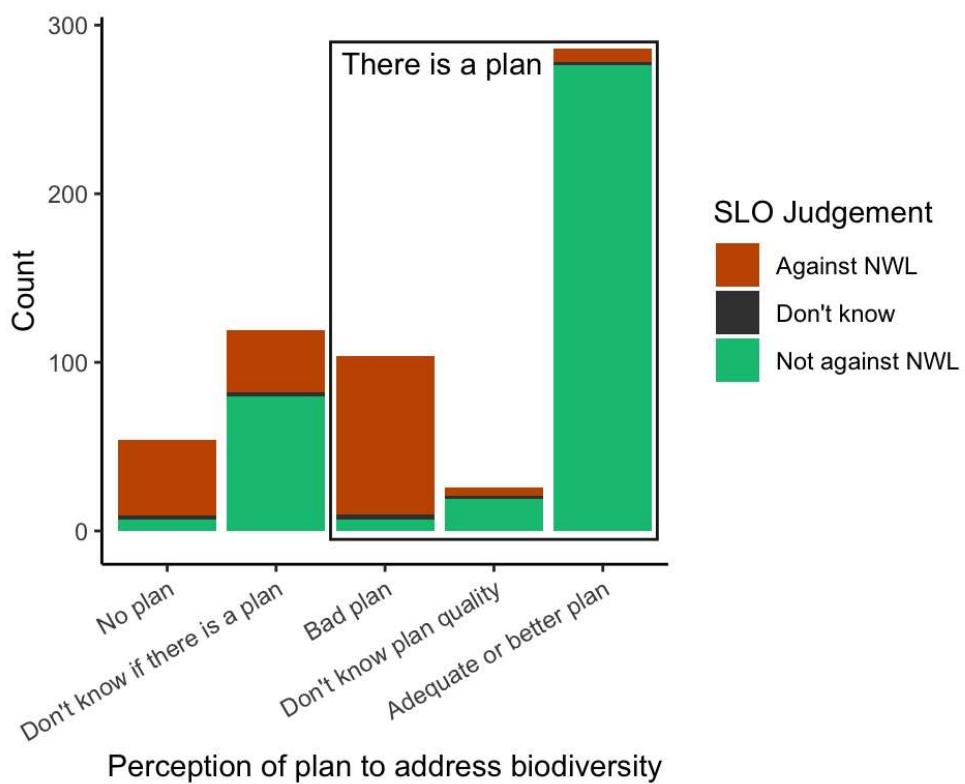


Figure 20: Respondents' perceptions of the plan to address the NWL's impact on biodiversity, aggregated from two questions: whether respondents believed there was a plan in place to address biodiversity impacts and, if they did think there was a plan in place, what they thought of the methods the NWL will use to address its impacts on biodiversity.

Towards the end of the questionnaire, text was provided on BNG and the NWL, with the option of a shorter or longer version for each text, to allow the respondents to answer questions on BNG even where they had no existing knowledge and assess how new information changed opinions. As a measure of respondents' existing knowledge, they were asked how much of each text they already knew. To understand whether judgements of the adequacy of any plan to address biodiversity was influenced by knowledge of the NWL and/or BNG a binomial general linear model was performed as described in Appendix 5D. Existing knowledge of the NWL and of BNG did not have a significant effect on whether a respondent judged the NWL to have an adequate plan to address biodiversity impacts. However, within the model, respondents who chose to see the additional information on the metric were significantly less likely to believe there was an adequate plan in place to address biodiversity impacts (estimate = -1.55, $p < 0.0001$). This cannot have been causative, as the choice to see the metric text was made on a later page of the questionnaire than the question on the plan to address biodiversity.

After showing the information on BNG, I asked respondents whether or not they believed it is possible to create a net gain in biodiversity through habitat creation, enhancement, and restoration after a loss of habitat due to development. The answers to these questions significantly differed depending on whether respondents were against the NWL or not (see Figure 21). Beliefs about whether BNG is possible also differed significantly from the general population, with those who were against the NWL significantly more likely to believe BNG **is not** possible than the general population (65.6% compared to 9.9% of population; pairwise proportion test: $p < 0.0001$) and those who were not against the NWL being significantly more likely to believe BNG **is** possible than the general population (68.9% compared to 58.2% of population; pairwise proportion test: $p = 0.0014$). Both those against and not against were also significantly more likely to provide free-text other responses than the general population (against: 25.2%, not against: 5.9%, population: 1.0%; pairwise proportion test: $p < 0.0001$ and $p = 0.003$ respectively); these responses tended

to express nuance or uncertainty, for example that BNG is possible in theory but not practice, or that it is possible in some cases but not for the NWL.

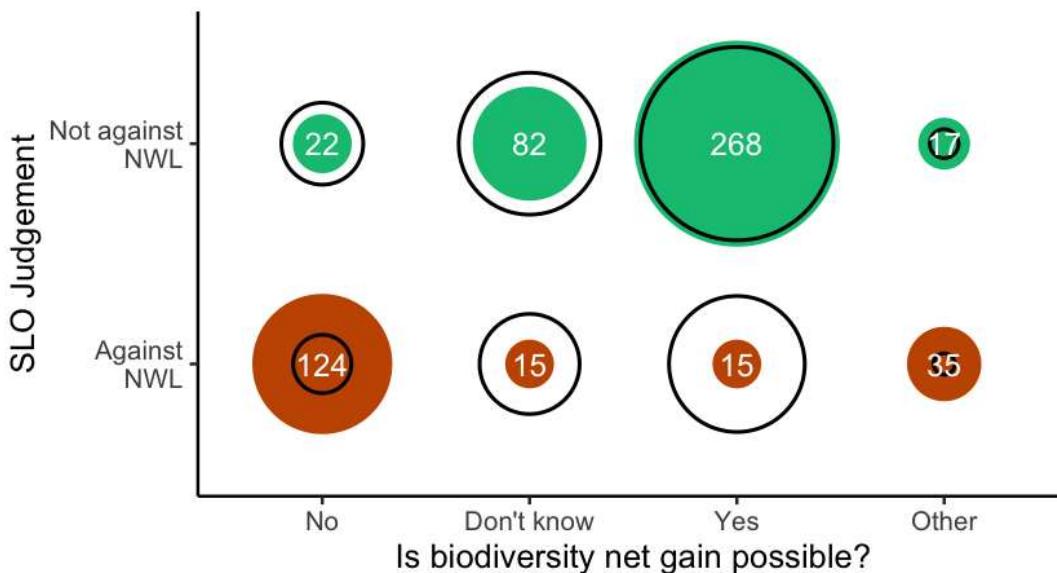


Figure 21: Whether respondents believed it is possible to create a net gain in biodiversity through habitat creation, enhancement, and restoration after a loss of habitat due to development significantly differed between respondents who were not against (green) and against (red) the Norwich Western Link ($\chi^2 = 318.93$, $df = 3$, p -value < 0.0001). Both groups significantly differed from the distribution of beliefs within the general population (black rings; Not against NWL: $\chi^2 = 70.4$, $df = 3$, p -value < 0.0001; Against NWL: $\chi^2 = 1280$, $df = 3$, p -value < 0.0001). Respondents that gave free-text or other answers have been excluded to allow comparison with general population.

After respondents had been shown information on the NWL's use of BNG for applicable habitats and likely impacts, respondents were asked about whether this had changed their opinions of different aspects of the NWL, the answers for which are shown in Figure 22. Reported change in overall view of the NWL differed significantly depending on the respondents' initial opinion of the NWL (Kruskal-Wallis chi-squared = 265.4, $df = 2$, p < 0.0001; all pairwise Wilcoxon tests significant at $p < 0.0001$). Those who were already against the NWL reported the most negative change in opinion (65.6% negative change, 0.5% positive change), followed by those with no initial opinion (32.2%

negative change, 23.7% positive change). The only group with a greater proportion reporting a positive change than negative was those who were initially not against the NWL (2.8% negative change, 40.9% positive change).

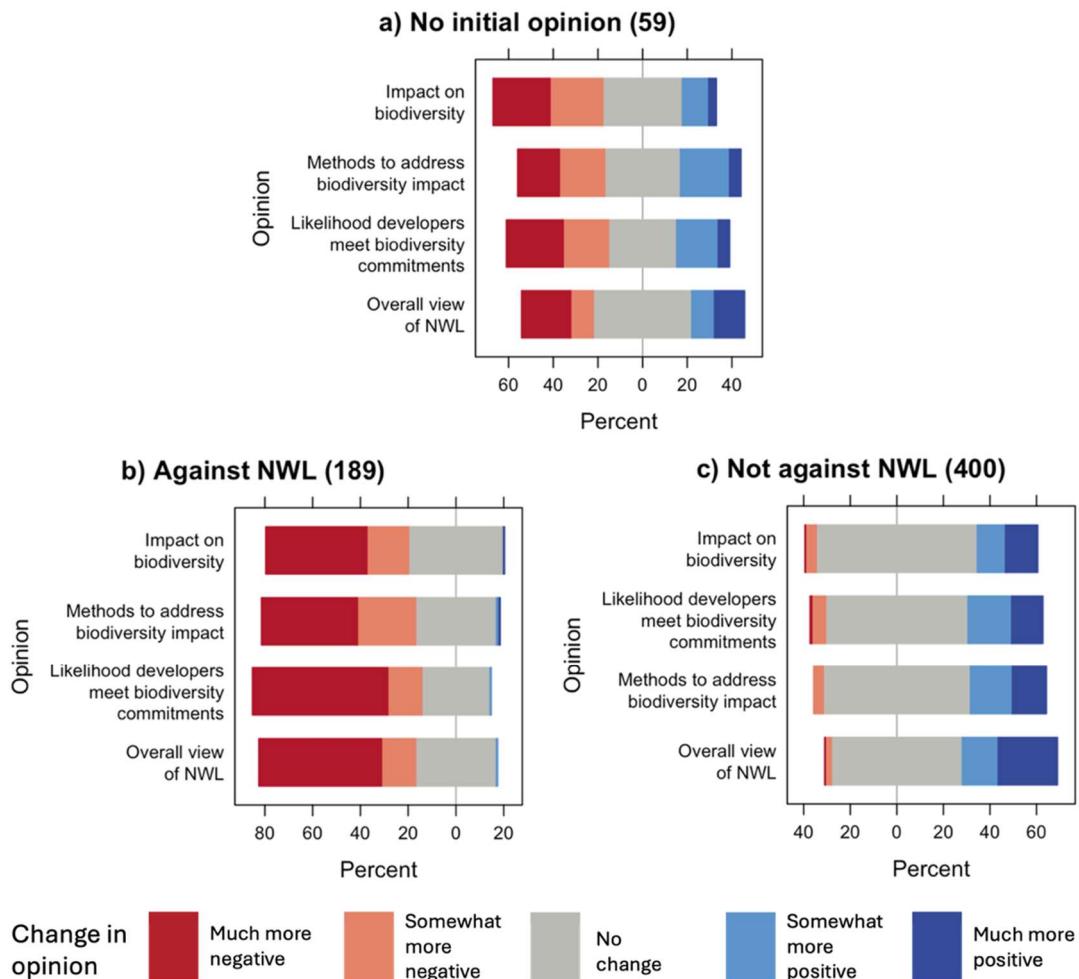


Figure 22: Respondents' self-reported change in opinion about different aspects of the NWL after having read the additional information on the NWL provided within the questionnaire split based on initial SLO judgement: (a) no initial opinion (either were not familiar with the NWL or did not know if they were against it); (b) against the NWL; and (c) not against the NWL. The individual aspects (the NWL's impact on biodiversity, methods used to address biodiversity impact, the likelihood developers of the NWL will meet their biodiversity commitments, and the respondents' overall opinion of the NWL) were presented in a Likert panel, with respondents asked to say whether the information had made their views "much more negative" (dark red), "somewhat more negative" (peach), "no change" (grey), "somewhat more positive" (light blue), or "much more positive" (dark blue).

6.5 Discussion

6.5.1 Did the Norwich Western Link engender a social licence to operate?

As might be expected from a case study chosen for its controversy, views on the NWL were highly polarised. Determining the level of SLO afforded to a project requires defining a community of interest and required level of consensus (see, e.g., Boutilier, 2014), something that is deliberately not done within this work, meaning I cannot give an answer as to whether the NWL has a SLO. I can say that 66% of my sample were not against the NWL, 68% if those who did not know if they were against the NWL are also included. Within those who were known to live in the local area (as they answered through my leaflet campaign), this proportion increases to 80%. Those who were not against the NWL had positive perceptions of the road's of social impacts, including the likely impacts on themselves, and a perceived the road to have a relatively neutral impact on the environment. This does not, however, negate the 34% of my sample for whom the NWL did not engender an SLO (as they were against the NWL) and who deemed all impacts of the road, other than perhaps on the local and national economy, to be very negative. It has previously been seen that this level of rejection is enough to cause substantial protest (Grimmer, 2019a; Parkin, 2024; Sinclair, 2023). The extent of polarisation, and strength of feeling that has been observed surrounding the project, potentially supports conclusion that many stakeholders have reached the most extreme level of SLO, psychological identification (Luke, 2017), with the project in the case of those not against the NWL and with the opposition movement in the case of those against it. Although more work would be needed to confirm it, this could be explained by the decades that have passed since the projects' inception and early consultations allowing opinions to become deeply entrenched.

Over a quarter of respondents (156) had an overall positive perception of the environmental impacts of the NWL, all but two of whom also had positive

perceptions of the road's social impacts, and none of whom were against the NWL. This reflects Norfolk County Council's messaging that the NWL will result in substantial reductions in carbon emissions (Norfolk County Council, 2022), while remaining relatively quiet about the environmental impact beyond the aim to achieve BNG for all applicable habitats and making the statement that "work has indicated that any impacts [on the designated sites and 'Ancient Woodland'] can be mitigated" (Norfolk County Council, 2024b). However, there is substantial evidence that the negative perceptions of the environmental impacts held by those against the project better reflects reality. The emissions forecast is calculated over 60 years, with significant use of petrol and diesel vehicles throughout (WSP, 2021b, Appendix D). This continuation of the (fossil fuel powered) car-centric status quo is increasingly recognised as incompatible with finding solutions to the climate crisis (see e.g. Miner et al., 2024; Ogunkunbi & Meszaros, 2023). The NWL's impact assessment recognises there will be some impact on ancient woodland, including the loss of ancient/veteran trees (WSP, 2021b, para. 7.7.10). Further, there is strong evidence for the landscape-level impact of roads on wildlife well beyond the footprint of the road itself, e.g., on bird populations and communities (Cooke, Balmford, Donald, et al., 2020; Cooke, Balmford, Johnston, et al., 2020). Indeed, the entire project has been withdrawn because of the negative impact on Barbastelle bats (Hakimian, 2025).

The stark difference in perceptions of the social and environmental impacts of the NWL between those against and not against the project, the tendency for respondents' perceptions across all impacts to correlate, and the absence of respondents with extremely conflicting views about the social and environmental impacts of the NWL indicate that respondents' perceptions of the NWL's social impacts affect their perceptions of the environmental impacts, and *vice versa*. This is a known phenomenon, for example, within the tourism industry residents who directly benefit from tourism tend to have a more positive perception of the environmental impacts (Andereck et al., 2005). I suggest two potential explanations. The first is that respondents thought that

providing a nuanced response would be less likely to result in the road being built (or stopped, depending on their preference) and thus answered all specific impacts with respect to their overall view of whether the road will be positive or not. The second, perhaps more interesting, explanation is the presence and avoidance of cognitive dissonance, the psychological discomfort that arises from holding inconsistent beliefs (Stone & Wood, 2018), which can be avoided through confirmation bias, where individuals are more likely to seek and believe information that confirms their existing beliefs, and motivated reasoning, in which individuals use biased methods of reasoning to come to their desired conclusion (Stone & Wood, 2018). In this case, such an explanation would mean that those not against the NWL due to their positive perceptions of its social impacts either avoid (confirmation bias) or explain away (motivated reasoning) evidence that the road's environmental impact will be significantly negative. This strategy avoids the discomfort associated with believing their desired project would harm the environment, potentially explaining why perceptions of the environmental impacts of the NWL are very rarely more positive than those of its social impacts.

Perhaps counter-intuitively, the likely presence of cognitive dissonance within supporters of the project may be explained by the relatively high level of concern for the environment within the British public. Four fifths (81%) of Britons think the environment is under threat (Laville, 2022), and climate change is the second greatest concern facing adults in Great Britain (74%) following only the cost-of-living crisis (79%) (Office for National Statistics, 2022). Even more relevant to the NWL, 81% believe it is usually or always unacceptable to build new road infrastructure that involves the damage or destruction of ancient woodland and 68% would be sad or angry if a large tree in their local area was felled for development (Bond, 2023). Where people want the road for its perceived positive social impacts, this would likely create cognitive dissonance due to simultaneously caring about the environment and supporting a road that will inevitably harm it, thus potentially driving the unrealistically positive perceptions of the road's environmental impact.

It is harder to know the extent to which perceptions of the social impacts of the NWL represent ‘reality’, as this will depend on people’s priorities and whether they are likely to use the NWL, as well as how much they care about factors such as additional noise and the visual intrusion of the proposed viaduct.

Although work based on National Highways’ (the government company responsible for road building in England) data suggests new road projects bring greater benefits than costs (Chapman, 2024), this is disputed, with analysis by sustainable transport consultancy Transport for Quality of Life suggesting that far fewer roads meet their social and economic goals (Sloman et al., 2017). Traffic models for the NWL suggest it will substantially decrease traffic in local villages (in particular, the villages of Weston Longville and Ringland), but increase the overall number of journeys, particularly on parts of the A47 and large roads into Norwich (e.g., Norwich Road and Dereham Road) (WSP, 2021c). It is, however, clear that the evaluation of social impacts differs between those for and against the NWL. More research is required to understand whether the observed differences in perception of social impacts is due to differing priorities of respondents or symptomatic of confirmation bias and motivated reasoning.

Ultimately, the likely presence of confirmation bias and motivated reasoning in respondents’ perceptions of the NWL’s impacts does not negate the fact that it appears to engender a strong positive SLO with many stakeholders and a strong absence of an SLO with others. However, as discussed in the next section, the avoidance of cognitive dissonance likely has implications for the extent to which BNG impacts SLO judgements.

6.5.2 Did BNG impact the SLO of the NWL?

Of those who believed the NWL has an adequate plan in place to address biodiversity impacts, fewer than 3% were against the project. BNG is broadly accepted as an approach to the environment by the English public (Chapter Four), however, neither knowledge of the NWL nor BNG were significantly associated with whether the respondent thought there was an adequate plan in

place, indicating that knowledge of BNG and the NWL using such an approach were not drivers of perceptions of the adequacy of the plan. The picture becomes clearer when I look at whether respondents believed BNG is possible, an important question as the policy relies on contested assumptions around the replaceability of nature (Chapter Five). From this, I see that belief that BNG is possible is highly associated with rejection of the NWL, with respondents not against the NWL more likely to believe BNG *is* possible (69%) than the general population (58%) and respondents against the NWL more likely to believe BNG *is not* possible (66%) than the general population (10%). This may be motivated reasoning: believing nature is replaceable is convenient when supporting a project likely to cause environmental harm. Alternatively, it may simply be that whether an individual believes BNG is possible is a strong deciding factor in whether or not they reject the NWL. Whichever the reason, I can conclude that BNG does not represent an adequate approach for addressing environment impacts for opponents of the NWL and thus is unlikely to improve their SLO judgement and may make it worse due to being seen as using a method that does not work.

BNG does appear to be an accepted approach for addressing environment impacts for those who are not against the NWL. In this way, BNG may act to solidify the SLO judgement of those already in favour of the project through providing a means of believing there will be minimal negative environmental impact, effectively a form of motivated reason. There is the potential that this will lead people who are pro-NWL to under-demand environmental protection to avoid facing up to the fact the road will result in a substantial environmental impact, similar to the way people in dangerous jobs under-demand safety procedures to avoid facing up to the amount of risk inherent in their job (Akerlof & Dickens, 1982). I found that respondents who thought the NWL had an adequate plan in place to address biodiversity impacts were less likely to choose to see information on the biodiversity metric used within biodiversity net gain, potentially out of a lack of interest or through not wishing to see information that may challenge their views.

Strong evidence for confirmation bias playing a large part in the impact of BNG on the SLO of the NWL is seen in the bias in reported impact of the additional information presented in the questionnaire on views of NWL: most (65.6%) respondents against the NWL reported that the information made their views more negative while respondents not against the NWL tended to report no change (56.3%) or that the information made their views more positive (40.9%). This reflects our understanding that the same information regarding controversial issues can be interpreted in opposing and polarising ways depending on the reader's prior views on the topic (see seminal work on opinions of the death penalty Lord et al., 1979) and further supports my conclusion that for projects with controversial environmental impacts, BNG is likely to further polarise SLO.

6.6 Conclusions

As expected, the NWL remained a highly polarising issue, engendering a positive SLO with most (66.0%) respondents but a strongly negative SLO with others (23.9%). Perceptions of the NWL's social and environmental impacts were correlated and also highly polarised, suggesting that confirmation bias and/or motivated reasoning are at play to reduce the cognitive dissonance associated with holding conflicting views of the social and environmental impacts of the project. I find that respondents' judgements of the NWL's plan to address biodiversity impacts were highly associated with rejection, with very few (2.6%) respondents who thought there was an adequate plan in place rejecting the NWL, compared to most who thought there was no plan (90.4%) or a bad plan (83.3%). However, this is not something BNG can 'fix' as over 80% of respondents against the NWL do not believe BNG is possible. I also found further indicators of confirmation bias in that respondents reported increased polarisation of opinions of the NWL based on reading additional information on the project and its approach to the environment.

In the context of this thesis, my findings suggest that BNG will not work to change the SLO judgements of those against environmentally controversial projects and may act to worsen views. This appears to be because those who reject projects due to their environmental impacts are less likely to believe in the fundamental assumptions underlying BNG and thus do not see compensation as adequate replacement for what was lost. In contrast, BNG does seem to be accepted as an approach to the environment by those who already accept the project and thus may increase the strength of SLO judgements, however, this may be due to the avoidance of cognitive dissonance as demanding stronger environmental compensation would require recognising the negative impacts such projects are likely to have.

This chapter provides an essential contextualisation of the issues around the acceptance of BNG brought forward within the previous three chapters within the wider discourse surrounding a controversial project. Biodiversity impacts are not the only important thing in determining benefit, with benefit to self (pragmatic legitimacy) also playing a key role as discussed in Chapter Two. Although this quantitative analysis is insufficient to fully confirm whether the conflicts and issues related to the acceptance of BNG impact the SLO of projects in practice, I do believe these results support the findings of previous chapters. For those who are pro-development (or in this case, pro-NWL) BNG appears to be seen as a positive, allowing the desired project to go ahead while addressing its environmental impact, thus fulfilling the original multiple aims that drove the development of the policy (see Chapter Three). However, as predicted within Chapter Five, many people object to BNG's potential role in facilitating development, rejecting its use for developments not deemed worthy of the damage they will cause, even where compensation is promised. This confirms that, although BNG's promise of associating development with environmental benefit is generally accepted, even applauded, in theory, this does not mean it can adequately counter criticisms of excess environmental harm in practice. In my next and final chapter, I will set the findings of this PhD in the context of previous work and understand what this means for

organisation going forwards, including recommendations on how to minimise the operational risk associated with BNG.

Chapter 7 Discussion, Recommendations, and Conclusion

Within this thesis, I set out to understand the acceptance of biodiversity net gain and its implications for social licence to operate, with a specific focus on mandatory BNG in England. This required two aims, the first was to understand the acceptance of mandatory BNG in England, and the second was to understand how mandatory BNG impacts the SLO of development projects. To achieve these aims, I have used literature review to develop a novel conceptualisation of SLO (Chapter Two); consulted with experts to build a timeline of the development of Mandatory BNG in England (Chapter Three); qualitatively analysed existing government consultation responses to understand the issues that may impact acceptance of mandatory BNG (Chapter Five); and collected and quantitatively analysed large questionnaire datasets (over 1000 total responses) to understand the acceptance of BNG within the English public (Chapter Four) and how BNG impacted the SLO of a large and controversial infrastructure project (Chapter Six). I find that BNG is generally accepted as an approach in an abstract sense and likely can improve SLO in some situations. However, conflicting priorities and contested assumptions mean BNG can drive polarisation of opinions around controversial projects. Below, I discuss the results of this thesis with regards to the two aims.

7.1 Aim One: To understand the acceptance of mandatory Biodiversity Net Gain as a policy.

7.1.1 Biodiversity Net Gain is widely accepted as a policy

Prior to this work, our understanding of the acceptance of BNG was primarily based on learning from biodiversity offsetting, primarily focussed on ‘expert’ opinion (e.g., Sullivan & Hannis, 2015; Taherzadeh & Howley, 2018) or specific

case studies (e.g., Apostolopoulou, 2020), and government analysis of government consultations (Defra, 2019). This gives an excellent understanding of some of the nuanced discussions about the issues surrounding net outcome policies and their use. It is, however, less useful for understanding overall acceptance and how BNG might impact the SLO of projects and organisations, as I had little information on whether the controversies identified within these groups extended to the more general public's opinions on BNG.

Based on Chapter Four, I now know BNG is generally viewed positively by the 500-person representative sample of the English public. 63.8% had a positive overall view of BNG as an approach to the environment, with a further 29.8% neutral, and 70% at least somewhat agreed that BNG would improve nature in England. This was accompanied by a prevailing, but not universal, acceptance of the assumptions underlying BNG: that it is possible to create a net gain in biodiversity after a loss due to development (58.2% yes, 30.8% don't know, 9.8% no); and that it is possible to measure and compare biodiversity with a standardised numeric metric (42.8% yes, 41.2% don't know, 18.8% no). Over half of respondents at least somewhat agreed that a project's environmental impact is acceptable if BNG is achieved. It is important to note that these views were based on relatively little existing knowledge of BNG and the statutory metric and thus may be prone to change as BNG becomes more prevalent. However, at least within my sample, those who reported having greater existing knowledge of BNG were substantially more likely to view the policy positively.

What is striking is that the above acceptance comes despite a decided lack of trust in most actors involved in BNG, particularly developers, found in Chapters Four and Five. This reflects past research which has found only 2% of the UK public trust developers, with most citing that they "only care about making money" (Champ, 2019, para. 3). BNG, in most cases, requires the acceptance of uncertain gains as compensation for certain losses, which creates a substantial element of risk as biodiversity will be lost if the compensation does not materialise (Weissgerber et al., 2019). In such cases where risks exist and actors are not trusted to act in interests other than their own, the role of

governance structures, such as regulation, increases in importance as a means of holding untrustworthy actors accountable (Chapter Two). It is within this context that I believe BNG must be viewed. The majority of the UK public care about the environment and believe action is required to protect and restore it (Laville, 2022) and BNG is such an action, at least on the surface, providing an opportunity to hold developers accountable through requiring that they improve nature as opposed to continuing to contribute to its decline.

7.1.2 Biodiversity Net Gain should be for biodiversity, not development

A problem arises when one looks at the origin of and motivations for BNG policy in England, as I did in Chapter Three. Protecting biodiversity is far from the only aim of BNG, instead the “primary aim is to secure a measureable [sic] improvement in habitat for biodiversity **whilst** streamlining development processes” (Regulatory Policy Committee, 2018, p. 1, bold added for emphasis). As such, the policy was developer guided by the objectives that “net gain: (1) delivers habitat creation, meeting the government's ambition to leave the environment in a better state than it inherited for the next generation; (2) is simple, streamlined and certain for developers, easy to understand and will not prevent, delay or reduce housebuilding; and (3) is of clear benefit to people and local communities” (Regulatory Policy Committee, 2018, p. 1). The desired streamlining of the planning system and subsequent benefit for development is one part of the wider neoliberal push towards the deregulation and market-friendly reregulation of environmental policy designed to facilitate continued development and economic growth (Apostolopoulou, 2016; Knight-Lenihan, 2020). Alongside this is a desire to “stimulate the growth of a market for biodiversity units” (Defra, 2018a, p. 35), part of a long-held aim to make biodiverse habitats more investable and find “opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect nature's services” (Defra, 2011c Annex I: para. 44).

Many of the objections to both BNG and BDO come from stakeholders disputing that the policy should provide benefit for development, fearing that providing benefit for development has the potential to result in net outcome policies being used to justify and facilitate developments that would otherwise be refused due to high harm (Chapter Five; Lockhart, 2015). Instead, it was argued that such approaches should not prejudice planning decision-making, only being used as a last resort in cases of ‘acceptable’ harm (Chapter Five; Sullivan & Hannis, 2015), and that the burden associated with BNG was a necessary part of protecting nature (Chapter Five). In a similar vein, I found the use of markets remains controversial (see Koh et al., 2019 for discussion of markets in offsetting), with 25.6% of respondents in Chapter Four at least somewhat disagreeing that developers should be able to buy pre-existing units from others.

The use of buyable biodiversity credits was particularly controversial (Chapter Five), with arguments reflecting those raised for biodiversity offsetting. Markets and buyable units were seen as allowing developers to be able to ‘pay to develop’ (Sullivan & Hannis, 2015), thereby providing them with, as perceived by some, newfound rights to destroy nature (Taherzadeh & Howley, 2018). Others rejected the idea of commodification of nature associated with markets (Apostolopoulou, 2020) both on intrinsic grounds and based on a perception that commodification would facilitate further biodiversity declines (Sullivan & Hannis, 2015).

Concerns around BNG’s use of markets and aim to facilitate development show the conflicting expectations of BNG. Whereas the policy has been introduced to facilitate continued ‘green growth’, many stakeholders retain the hope that it will instead be a means of putting nature before development and ensuring the required resources are put into protecting biodiversity.

7.1.3 Value conflicts exist in Biodiversity Net Gain practice

Having multiple aims and the expectation that BNG will deliver ‘win-win’ solutions not only brings the ideological objections discussed above, but also introduces fundamental value conflicts in how BNG should be achieved. These value conflicts drove deep-rooted tensions within biodiversity offsetting (BDO) in England and are attributed a large part of the responsibility for the abandonment of attempts to introduce BDO legislation in the 2010s (Lockhart, 2015). Using the results from Chapter Five and the existing literature on BNG and BDO, I have split these into two broad conflicts: simplicity and certainty vs complex (socio)ecology; and reduced regulatory architecture vs robust environmental protection.

7.1.3.1 *Simplicity and certainty vs complex (socio)ecology*

BNG policy in England, like BDO before it, has a stated aim of streamlining and increasing certainty in the planning system (Defra, 2013a, p. 8, 2018, p. 10). As for BDO, the method chosen to achieve this streamlining within BNG is abstracting biodiversity to a single, placeless number (Apostolopoulou, 2016) which, by its very nature and requirement for operability, will be an incomplete and value-laden estimate of the worth of biodiversity at a given site (Sullivan & Hannis, 2015, 2017). This, at least in the case of the area-based metrics used in BDO and BNG, represents a particularly narrow view of nature’s value and, for example, does not take into account the intrinsic and cultural values of nature (Taherzadeh & Howley, 2018), nor does it account for the ecological components with any real accuracy (Duffus et al., 2024; Hawkins et al., 2022; Marshall et al., 2024). This simplification of nature into a single number creates subjectivity in both the measurement itself (Apostolopoulou, 2020) and in what constitutes ‘acceptable’ or technically feasible compensation (Apostolopoulou & Adams, 2019). As such, the biodiversity value is open to be contested (Sullivan & Hannis, 2017), creating the potential for creative amendments to negotiate conflicting requirements; non-equivalent exchanges and negative conservation outcomes; and diminished or non-existent

conservation yields due to the pressure of creating value for money (Carver & Sullivan, 2017).

The uncertainty inherent within net outcome approaches also further complicates attempts to create a simple and easy approach. By their very nature, BDO and BNG allow for biodiversity loss that might never be (fully) compensated, whether due to the difficulty of restoring habitats or failures of implementation (Sullivan & Hannis, 2015; Taherzadeh & Howley, 2018). Although some stakeholders argue otherwise, the evidence base for net outcome policies achieving their goals is weak (Sullivan & Hannis, 2015; Taherzadeh & Howley, 2018).

Through creating biodiversity values with a false sense of objectivity in the name of simplifying the process, the abstraction of biodiversity unintentionally adds new complexity around how compensation should be prioritised: if you have a choice of compensation options with the same ‘value’, which do you choose? Within BDO, it was noted that social values, such as access to nature, were at risk of being marginalised (Griffiths et al., 2019; Jones et al., 2019). This could be a deliberate strategy, through favouring sites purely ‘for nature’ which are often located distant to the impacted communities (Mancini et al., 2024) and/or where access is forbidden or restricted to minimise disturbance (Apostolopoulou & Adams, 2019). Alternatively, the exclusion of social values may be inadvertent if, for example, compensation site choice is driven more by the price and availability of land rather than its suitability (*ibid*). These issues represent part of wider arguments about what BNG, and other net outcome policies, should aim to achieve:

- Should net outcome policies be focussed on ecosystem services, a broadly anthropocentric view; or the conservation of species and habitats for their own sake, a more ecocentric view?
- Should the focus be on those individuals impacted by the development, for example through distance-near compensation; or should it instead be on improving national (English) outcomes as a whole, whether that

be through locating the compensation in areas with little existing nature, or in strategic locations where they may be able to provide the greatest benefit?

I do not pretend to have an answer to these questions, largely because they are political and value-based, making it difficult to conclusively answer them even with more research. Instead, moral and explicit choices are required over what should be prioritised (Schmid, 2008). By focussing simply on the outputs of the metric, the issue of what BNG should prioritise becomes depoliticised through its framing as a technical question that can be solved by expertise. This allows for the manufacturing of consensus and the suppression of questions related to uncertainty and values (Apostolopoulou & Adams, 2019). This, *inter alia*, leads to the exclusion and disempowerment of local communities and stakeholders who may lack the expertise and money to challenge offset calculations (Apostolopoulou, 2020; Apostolopoulou & Adams, 2019). It is of note that the planning system offers local planning authorities very little guidance on how to navigate the inevitable conflicts that will arise (Condon, 2020), meaning there is every chance that costly and time-consuming conflicts will arise due to the complexity inherent in handling the multiple values and framings at play.

7.1.3.2 Reduced (regulatory) burden vs robust environmental protection

As a neoliberal policy, BNG aims, *inter alia*, to reduce the regulatory burden associated with meeting biodiversity commitments through deregulation and increasing the role of private finance in conservation reregulation (Chapter Three; Apostolopoulou, 2016). However, the focus on reducing regulatory burden and ensuring BNG does not delay development has led to a policy where: the requirements, such as the amount of biodiversity, duration of protection, and complexity of metric, have favoured pragmatism over comprehensiveness (Chapters Three and Five); substantial governance gaps exist, where there is little to hold developers accountable in case of failure (Rampling et al., 2024); and that puts considerable power in the hands of developers to (re-)negotiate and reduce biodiversity requirements (Carver &

Sullivan, 2017; Condon, 2020). The lack of trust in developers means this is a problem for acceptance as, without robust regulatory architecture to hold them accountable, developers are seen as being opportunistic (Apostolopoulou & Adams, 2019), only interested in profit, and rarely delivering what is required of them under the current system (Sullivan & Hannis, 2015).

Creating confidence that ecologically (and/or socially) meaningful BNG will be achieved would require substantial supporting regulatory architecture (Condon, 2020) and independent oversight by bodies with the ability and resources to properly enforce requirement. This would likely increase the regulatory burden and negate the benefit of using developer resources to address biodiversity loss (Condon, 2020). The importance of trustworthy governance and independent oversight and expertise in the acceptance of BNG is also supported by the findings of Chapter Four. It is, however, in stark contrast to the current regulatory context where austerity has significantly reduced the resources of local authorities (Condon, 2020; Knight-Lenihan, 2020; Taherzadeh & Howley, 2018) and central government's push for deregulation and localism has resulted in a planning system that seems unlikely to be able to meet the ecological demands of BNG (Condon, 2020). To some extent, this lack of trust may be able to be mitigated by the involvement of wildlife charities lending their legitimacy to BNG projects as part of a non-governmental partnership. However, this reassignment of ecological duties proved controversial within BDO (Apostolopoulou et al., 2014) and is unlikely to be feasible for every project without fixing the remaining governance and trust gaps which would, again, likely require increased regulation and funding.

7.2 Aim Two: To understand how Biodiversity Net Gain impacts the SLO of development projects.

Within Section 7.1.1, I discussed how BNG has widespread, but not universal, acceptance as an approach to managing nature. This is important as it means, for most people, using BNG as an approach for nature management is unlikely to negatively impact SLO judgements of projects and organisations. In Section 7.1.2 I then go on to point out that BNG's aim of benefitting both development and nature threatens acceptance of the policy as it raises concerns BNG will be used to facilitate development that would not otherwise be allowed to go ahead. However, this is not always the case.

In Chapter Six, I look at the Norwich Western Link (NWL), a controversial road project proposed in the East of England which had a stated aim of achieving BNG for all applicable habitats before being withdrawn due to the presence of a super colony of protected barbastelle bats. The road has been a highly emotive issue in the area. Those who wanted the NWL felt failed by the poor infrastructure planning in the area leaving them with poor transport links and plagued by traffic using local single-track roads as rat runs. On the other hand, those against the road saw it as unnecessary devastation of an ecologically and socially significant habitat, just for the sake of convenience.

Rather than consistently providing (or reducing) legitimacy, questionnaire respondents appeared to use BNG to support existing views about the NWL. Respondents who were against the NWL tended to perceive the environmental (and often social) impacts to be very negative and did not believe BNG is possible at a significantly higher rate than the general English population, with additional information tending to make their views much more negative. There is an interesting point to be made that projects where the use of net outcome approaches has been criticised often also receive criticism that the

development itself is not appropriate, as opposed to solely the environmental impacts (e.g., Apostolopoulou, 2020, expensive executive housing). This indicates that, at least in these controversial cases, the use of BNG is not creating new opponents to projects but instead may act to further solidify negative SLO judgements.

To some extent, I see the negative impacts of BNG on the SLO of the NWL as being like the Desmoulin's Whorl snail, the centre of a legal battle that almost halted the construction of the Newbury bypass (Gregory-Kumar, 2017; Royal Berkshire Archives, 2020); although the snail and BNG are unlikely to have been the reason people initially objected to the both roads, they become inexorably tied up in the movement trying to stop such developments. BNG did, however, seem to confer legitimacy with people who supported the NWL, who tended to perceive the environmental impacts of the road to be positive or relatively small and believed that BNG is possible. In contrast to those against the NWL, new information on the road and its approach to nature tended to either not change perceptions of the NWL, or make them more positive.

The results presented within this thesis, combined with the evolving political climate we are currently facing, indicate that the broader implications of BNG policy on SLO are likely to be mixed. While there is significant evidence that the UK public care deeply about nature (Laville, 2022), over two thirds of Britons believe that infrastructure is not being built quickly enough (Ipsos, 2023), with increasing political furore about nature's purported role in 'blocking' development (Elgot & Duncan, 2024). In this seemingly contradictory context, BNG's dual aims of creating environmental improvement while streamlining development appear appropriate. My results indicate that, by promising compensation, BNG allows stakeholders to reconcile conflicting views around the negative environmental impacts of projects they deem necessary, potentially bolstering their SLO judgements. However, we know from existing controversy that BNG does not eliminate conflict. My results suggest the pragmatism embedded within BNG means where there is controversy around a project's environmental impacts, BNG will

be seen by some as both inadequate and dishonest, particularly where developers are perceived to have passed on the responsibility for providing compensation, potentially strengthening opposition. As such, although the results presented within this thesis suggest BNG is unlikely to create new opposition to projects, there lies considerable risk in believing achieving the requirements of BNG policy means a project will be seen by all to have achieved a genuine net gain in biodiversity.

7.3 What does this research mean for organisations?

Although BNG appears to be more popular than its predecessor, BDO, this thesis has shown that it has inherited the same major value-conflicts. The incomplete valuations, contested calculations, and uncertainty involved in 'netting' biodiversity in a way that is operational, let alone streamlined, for planning and development means the concerns and outrage that can arise surrounding projects aiming to achieve BNG are not likely to be solved by technical innovation and expert discussion. Further there is very little trust in many of the actors involved in BNG, particularly private developers, and perceptions that there are no means of holding organisations accountable both because the government is overly pro-development (Prno & Slocombe, 2014), and because there is a lack of local authority capacity (Zhang & Moffat, 2015). Together, this means legal compliance with BNG cannot be relied on to make project's biodiversity impacts acceptable. In some cases, I believe this is a good thing, as there are projects for which I believe the impact is unacceptable irrespective of the amount of compensatory habitat created. However, given that some infrastructure development, such as greener energy sources, will likely be required to meet social and environmental targets, it is important to understand how to provide biodiversity compensation in a more acceptable way.

Based on the above discussion and building on the authors' knowledge of BNG, SLO, and risk management literature, the following steps are suggested to address this conflict and thus reduce (but not remove) operational risk:

1) Avoid the problem

Avoided damage does not need to be compensated for, meaning strict adherence to the mitigation hierarchy reduces the chance of your loss, and subsequently compensation, being controversial. Organisations must not use BNG as an excuse to bypass looking for alternative options to building on biodiverse areas, and justify developments that would not otherwise get planning permission, or, for developments that do have to go ahead, minimising their biodiversity impacts. Ensuring that all possible harm has been avoided and development is designed in a way to maximise its value to nature will likely help in reducing arguments that BNG is being used as an excuse for development. As the success of compensation is uncertain, and its ability to make up for losses contested, it should not be assumed to make up for the certain harm that people and biodiversity have incurred because of the development.

2) Go beyond compliance

Where impacts cannot be avoided, the market and development friendly character of BNG legislation means it cannot be expected that meeting the legal obligations for BNG will be enough to achieve acceptance. Where possible: provide more compensation, as large multipliers are one of the best ways to increase the likelihood of success at achieving BNG (zu Ermgassen et al., 2019); consider the social (e.g, Asah & Blahna, 2020) and ecological (e.g., Duffus et al., 2024) value of habitats beyond the metric; and aim for longer-term protection, as only habitats maintained for at least the lifespan of the development can achieve genuine net gain (Moilanen & Kotiaho, 2018).

3) Community participation

The inclusion of the local community and other impacted stakeholders in the decision-making process is a key aspect of procedural legitimacy, which contributes to both trust (discussed in point four) and the overall acceptance of a project (Chapter Two). There are existing minimum requirements in place in England through implementation of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (UNECE, 1998). This provides a sound legal basis for the community being able to meaningfully participate in the decision-making process, requiring that they are given transparent access to information about the project, proper opportunity to express their views, and that the decision-makers go in to the discussions with minimal bias (MacPhail et al., 2022). Through genuinely listening to and understanding the community's values developers can reduce the chance of unintentionally or unnecessarily damaging areas of high social value and may create opportunities for win-wins, although as discussed, this should not be an expected outcome.

4) Acknowledge conflict

In some cases, organisations will be going into a project with a pre-determined outcome in mind that the public and/or other stakeholders do not have the power to change, nor have the time or willingness to work collaboratively. This will tend to reduce acceptance, and potentially trust in the offending organisation, as stakeholders are likely to feel they are not being listened to (Chapter Two). Where this is the case, or where discussions reveal insurmountable value conflicts within and/or between public and other stakeholders, it is essential to be up-front and acknowledge stakeholders' concerns including what habitats and ecosystem services are likely to be lost due to the development, as well as any uncertainties in the compensation and how they are being dealt with. Failing to acknowledge risks and disagreements is likely to increase outrage and conflict as stakeholders feel they are not being told the truth, contributing to increased perception of risks (Johnson & Sandman, 1992; Sandman et al., 1993).

5) Create accountability

Trust is an essential foundation to the acceptance of a project as, by definition, it increases stakeholder's willingness to be vulnerable (Chapter Two) and trusted actors are more likely to be seen as acting fairly (Bianchi & Brockner, 2012) and making acceptable decisions (Moffat & Zhang, 2014), with the opposite being true where trust is lacking. Although public participation and acknowledging conflict should both increase trust, rebuilding trust is difficult as many stakeholders will assess trustworthiness based on stereotyping and reputation, as opposed to knowledge of the organisation's current actions (Chapter Two). Given the neoliberal context and based on perceived poor local planning authority capacity, organisations are likely to have to create their own accountability structures so stakeholders are confident that failures will be resolved. It is likely that including other trusted and independent actors such as wildlife charities where possible will improve acceptance as they are more trusted in their role within BNG (Chapter Four), however, it is important that funding for this comes from developers so they are not seen as passing on their responsibilities.

7.4 Future directions

I am writing this discussion during a particularly tumultuous time for mandatory BNG and biodiversity in planning in England more generally (Monbiot, 2025). However, I believe there is still significant value in understanding the underlying issues at play to better inform future practice under potentially weakening English policy (*ibid*) and the global proliferation of approaches based on the English statutory metric (White & Panks, 2024). As regulations weaken, legal compliance is unlikely to be enough to guarantee acceptance and the power of people to impact project and organisation level success becomes a more important factor in ensuring good practice from organisations (Chapter Two). Much of the future work listed here has been begun during this PhD and awaits completion, subject to future funding.

7.4.1 Non-controversial case studies

The Norwich Western Link provides interesting insight into how BNG interacts with SLO for a controversial case study, likely the place where impacts on acceptance are most extreme. However, most projects are smaller and deal with less ecologically significant habitats. Thus, to fully understand how BNG impacts SLO we must look at non-controversial and best practice case studies to understand stakeholder expectations in these situations.

7.4.2 More in-depth qualitative analysis

Much of the research presented in this thesis uses quantitative analysis from questionnaires, which is excellent for gathering data from a large number of people quickly, but lacks the nuance required to draw out confident conclusions around causation. As such, future work should incorporate qualitative analysis of in-depth interviews to properly understand why BNG appears to polarise SLO for the NWL and identify how this might apply to other situations.

7.4.3 Stakeholder views on how the different values should be prioritised

Within this thesis I have presented substantial conflicts over views on what BNG should prioritise, but not the solutions to these conflicts. More research is required to understand how different stakeholders believe BNG should prioritise compensation and the extent to which this is influenced by context. Further, this is required to understand how stakeholder priorities interact with social and ecological outcomes of the policy.

7.5 Conclusions

This thesis has investigated the acceptance of BNG and its impact on SLO. I have argued throughout this work that, although is widely accepted as an approach to addressing biodiversity impacts in England, its existence within and perpetuation of, a neoliberal policy context leads to conflicting policy priorities that undermine acceptance in practice, with the potential to polarise the SLO of projects. In particular, I demonstrated that the positive opinions of BNG appear to be rooted in a desire to hold untrustworthy developers accountable and provide robust and comprehensive protection for nature within the planning system. This is in contrast to the regulatory intention of BNG as a pragmatic tool for delivering habitat gains whilst also facilitating development through streamlining the planning system, with the requirement for operability and minimal burden necessitating tools and regulations too simple to achieve confidence that BNG will be achieved. I explored how BNG further polarises the SLO of a large controversial proposed infrastructure project, conferring legitimacy and (somewhat) improving the opinions of people who already accepted the project whilst worsening the views of those against the project, who saw BNG as a simultaneously impossible and inadequate target, preferring instead that the biodiversity in the area were not lost in the first place. Through the use of large sample size methods, this thesis expands our understanding of the acceptance of BNG beyond direct stakeholders of projects and to the wider English public. In doing so, I conclude that the widespread acceptance of BNG as an approach to the environment means that, where a project is already accepted (or at least not rejected), BNG is likely to improve SLO. However, where a project's impacts are controversial, the tendency of BNG to depoliticise discussions and provide a false sense of objectivity is likely to deepen tensions, resulting in negative SLO outcomes. As such, the best way to reduce the operational risk associated with BNG is to avoid unacceptable impacts on the environment. Where this is not possible, maintaining SLO will likely require going beyond compliance, acknowledging conflicts and the moral decisions made around which values

are prioritised, and building accountability structures to increase confidence that the promised compensation will be delivered.

Appendix 1 Author Statement Regarding Co-authored Publications

Alice Stuart wrote all the chapters, with editorial suggestions made by primary PhD supervisor Alan Bond and secondary supervisor Aldina M.A. Franco throughout. Further advice about how this research could be made most useful for industry was provided by industry supervisors Chris Gerrard (Anglian Water Services Ltd.) and Dr Julia Baker (HS2, Wood plc, and Mott McDonald).

The work from this thesis has appeared in the following jointly-authored publications:

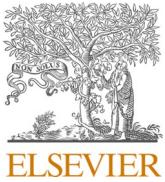
Chapter 2 is published in Resources Policy:

Conceptualising Social Licence to Operate. Alice Stuart, Alan Bond, Aldina M.A. Franco, Julia Baker, Chris Gerrard, Vittoria Danino, Kylie Jones, Conceptualising social licence to operate, **Resources Policy**, Volume 85, Part A, 2023, 103962, ISSN 0301-4207, <https://doi.org/10.1016/j.resourpol.2023.103962>.

Alice Stuart: Conceptualisation, Methodology, Investigation, Data Curation, Visualisation, Writing – Original draft preparation, Writing - Review & Editing.

Alan Bond: Conceptualisation, Writing - Review & Editing, Supervision.

Aldina M.A. Franco, Julia Baker, Chris Gerrard, Vittoria Danino, and Kylie Jones: Conceptualisation, Writing - Review & Editing.



Conceptualising social licence to operate

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ABSTRACT

In the 25 years since its inception, the concept of social licence to operate (SLO) has become widely used within both industry and academia. Despite this, there is no agreement as to what SLO is and what is required to achieve it. This conceptual ambiguity results in organisations struggling to understand how to achieve SLO and leaves many cynical about its use. Through literature review, this paper brings together existing conceptualisations of social licence to operate, presenting an explanatory model for how individuals form SLO judgements. We highlight four key stages in the formation of an SLO judgement: the assimilation of information by the individual; the formation of perceptions about the project; the application of cognitive processes to these perceptions; and the formation of legitimacy, trust, and overall SLO judgements. Next, we highlight the role of actions as the link between SLO judgements and operational outcomes. We note that where individuals' negative SLO judgements are suppressed, or they lack power over organisations, they will not have an impact on operations, causing an uncoupling of SLO judgements and operational outcomes. This uncoupling can also occur if operations are halted for non-SLO related reasons. This model represents a greater level of detail as to the process by which individuals form SLO judgements than previous conceptualisations, thus providing a clearer understanding of how the components of an SLO interact with each other.

1. Introduction

1.1. What is SLO?

The popularisation of social licence to operate (SLO) as a term is generally attributed to ex-Placer Dome Director of International and Public Affairs, Jim Cooney (Cooney, 2017). In the face of globalisation, mining companies were operating in countries where they faced uncertain reactions and anti-globalisation sentiment (Gjølberg, 2009; Miller, 2014). Further, whereas previously relationships between mines and local communities had largely been 'out of sight of the rest of the world' (Cooney, 2017, p. 198), the communications revolution provided greater opportunity for impacted communities to inflict financial and reputational damage, increasing their potential to have a negative impact on operations (Morrison, 2014). Cooney used the term to highlight the increasing need for industries to go beyond regulatory

requirements imposed by a country to manage and minimise socio-political risk (Cooney, 2017; Edwards et al., 2016).

SLO is widely considered to represent the ongoing acceptance, approval and support from communities and/or stakeholders (Black, 2013; Business for Social Responsibility, 2003; Cleland, 2013; Joyce and Thomson, 2000; Parsons et al., 2014; Thomson and Boutilier, 2011) however, the definition of 'stakeholder' and who should be included in it is still disputed (Boutilier, 2020). Other authors focus on the presence of, and requirement to meet, societal demands and expectations (Business for Social Responsibility, 2003; Gunningham et al., 2004; Howard-Grenville et al., 2008; Thornton et al., 2003) and norms (Harvey, 2011), some of which may be tacit (Howard-Grenville et al., 2008), beyond any legal requirements (Business for Social Responsibility, 2003). Some focus on the procedural aspects, defining SLO as the 'continuous engagement process ... to build trust and obtain legitimacy, leading to dynamic levels of consent or rejection' (Leeuwerik et al., 2021, p. 5).

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Alternatively, Salim (2003) presents a rights-based definition of SLO as the right for Indigenous peoples and other impacted groups and individuals to participate in decision making and give free prior and informed consent (FPIC) throughout the project's lifecycle.

Given these potentially contradictory definitions and approaches (Cooney, 2017; Dowd and James, 2014; Hall, 2014), SLO remains a nebulous concept which continues to incite debate on what exactly it is and how it can be measured (Jijelava and Vanclay, 2018; Moffat et al., 2016). The use of the term 'licence' is much disputed as it implies a binary state, where organisations have an SLO handed to them by a single 'community' without which they cannot continue operations (Dare et al., 2014; Parsons and Moffat, 2014). Instead of this, it is widely agreed that SLO is intangible, unwritten and tacit (Bice et al., 2017; Franks and Cohen, 2012; Parsons and Moffat, 2014). Almost all projects have a multiplicity of stakeholders, all of whom are subject to different norms and expectations that must be adhered to in order to garner acceptance (Dare et al., 2014), doing away with the concept of a single licence. Further, feelings about a project can vary in strength, meaning there are different levels to which stakeholders can accept an organisation and/or project ranging from complete absence of SLO to full trust and psychological identification (Boutilier and Thomson, 2011; Thomson and Boutilier, 2011).

SLO has been contextualised as one of three 'licences' required for an organisation to operate: the SLO, the legal licence to operate (LLO), and the political licence to operate (PLO) (e.g. Bice et al., 2017; Morrison, 2014). Unless they wish to be criminalised, organisations must follow all regulations and laws related to their activities, thus fulfilling their LLO (Boutilier, 2020; Brueckner et al., 2014; Leeuwerik et al., 2021; Morrison, 2014). The PLO represents the need for governmental and political approval for organisations to undertake activities (Brueckner et al., 2014; Morrison, 2014) 'based on its contribution to the state's development agenda' (Brueckner et al., 2014, p. 315). The PLO and LLO are outside the scope of this paper, however it is recognised that they are critical for an organisation to operate in any specific context and represent important contextual background for the SLO.

This paper will use Thomson and Boutilier's (2011) early and influential definition of SLO: 'the level of approval that an industry, organisation, or project realises from its stakeholders' as it remains general enough to encompass many of these diverse understandings of SLO.

1.2. Why does SLO matter?

Many organisations create negative environmental and social externalities (e.g. Parsons et al., 2014; Shaw, 1992) and are therefore seen as acting out of place (Gjølberg, 2009; Miller, 2014). Failing to address issues that matter to stakeholders can lead to protest (Jijelava and Vanclay, 2017), which can incur substantial costs and cause reputational damage (Franks et al., 2014). Protest can take many forms, and has a wide range of potential impacts (Hanna et al., 2016). These impacts can occur to both the organisation and the project itself (Franks et al., 2014; Vanclay et al., 2015), and may spill over to other organisations in the industry, for example through making more stringent regulations politically expedient (Jijelava and Vanclay, 2017). Stakeholders have a genuine power to impact, and in some cases entirely halt, operations (Edwards and Lacey, 2014; Jijelava and Vanclay, 2018; Miller, 2014; Syn, 2014) representing the sociological reality underpinning the need for SLO (Miller, 2014).

To manage and mitigate the risk associated with poor stakeholder relations, organisations, particularly those in the extractive industries, have begun adopting SLO as a business imperative (Cooney, 2017; Miller, 2014). This represents a heightened awareness of maintaining good community relations to manage socio-political risk associated with stakeholder opposition, thereby reducing the impact on operations (Hall, 2014; Jijelava and Vanclay, 2014; Miller, 2014). In some cases, to claim positive SLO, organisations conceptualise SLO at a level easier to

control by restricting issues to a local level, minimising regulatory implications, marginalising dissent and managing their reputation (Parsons et al., 2014). This approach is often accompanied by a lack of acknowledgement of stakeholders' ability to withdraw SLO (Dowd and James, 2014; Parsons and Moffat, 2014) and ultimately acts to reduce the influence of communities on operations (Parsons and Moffat, 2014).

Treating SLO solely as a business practice or sociological reality does not reflect the actual needs and demands of the impacted stakeholders, with little clarity as to whether SLO requires any more than avoiding inciting sufficient opposition to halt operations (Miller, 2014; Syn, 2014). Thus, in these cases SLO depends less on stakeholder opinions and more on the willingness and capacity of stakeholders to act in a way that halts operations (Syn, 2014). Stakeholders often lack the power required to halt operations, meaning that even if they reject a project, there may be negligible impacts on the project or company (Syn, 2014; Wilson, 2016). Under this approach, communities that are poor, marginalised, weak, divided or disempowered in some other way are left unable to withdraw SLO and at risk of suffering from industrial bad practices (Miller, 2014; Wilson, 2016).

To address this, many authors have highlighted the importance of concepts such as free, prior and informed consent in SLO (Bice et al., 2017; de Jong and Humphreys, 2016; Koivurova et al., 2015; Morrison, 2014; Taylor and Mahlangu, 2017), acknowledging 'the right of communities to grant and/or withdraw their permission for businesses or other organisations to locate and undertake activities within their jurisdiction' (Miller, 2014, p. 388). This approach sees SLO as an evolving form of governance (Miller, 2014), promoting communities' human right to self-determination (Vanclay, 2017) and addressing calls to move away from industry definitions of SLO designed to allow continued operation (Syn, 2014). It also promotes the consideration of social risk, the potential negative impacts and perceived threats faced by the community itself when dealing with SLO (Bice et al., 2017), as opposed to focussing on the risks to the organisation.

Thus, the importance of SLO is in the explicit recognition and consideration of the financial, reputational and community risks associated with failing to meet stakeholder needs and expectations.

1.3. How is SLO achieved?

Understanding how SLO is gained is essential for the management of risk, and planning of associated monitoring within organisations genuinely looking to acquire and maintain an SLO (e.g. Boutilier and Thomson, 2011) while avoiding claims of green-washing (Hamann and Kapelus, 2004; Vanclay, 2017). Further, understanding how SLO is gained reduces the ability of organisations to legitimise controversial actions through claiming SLO without justification (Bice, 2014; Gehman et al., 2017; Owen and Kemp, 2013; Parsons and Moffat, 2014). Therefore, there is a pressing need to understand how to gain an SLO.

Many conceptual questions remain, hindering our understanding of how SLO is gained. One set of questions queries which stakeholders need to accept a project for it to legitimately claim to have SLO (Boutilier, 2014; Brueckner and Eabrasu, 2018). Along these lines, Wüstenhagen et al. (2007) developed a triangle model detailing the three types of acceptance: Sociopolitical (acceptance of ideas and technologies by stakeholders); Community (acceptance by local stakeholders); and Market (acceptance and perpetuation by the market). However, separation of SLO by stakeholder group leads to questions over how to weight differing stakeholder opinions in the case of conflict (Boutilier, 2014, 2020). Further, the extent of consensus required within and between stakeholders is still uncertain (Boutilier, 2014; Jijelava and Vanclay, 2014; Wilburn and Wilburn, 2011).

Given this lack of consensus on who constitutes a stakeholder, for the purpose of our research we will propose a new definition for stakeholder within SLO: "a person, group, or organisation with a stake (interest) in the subject activity, whose interest is not solely political or legal in nature". This draws on the generic definition presented by McGrath and

Whitty (2017) adapted to include only those who can make a judgement on the acceptability of a project or organisation (i.e. a person, group, or organisation) and exclude those whose interest is solely political or legal in nature to accommodate for the separation between SLO, political licence to operate, and legal licence to operate (Bice et al., 2017; Morrison, 2014). This paper will focus on the individual level as decision-making and change is influenced heavily by the actions of individual change agents (Munduate and Bennebroek Gravenhorst, 2003). We recognise this does not address the dynamics between individuals and power disparities that occur to form organisational or group judgements, however we argue it is a necessary first step in understanding the process of SLO formation.

There are also questions around elements required to achieve SLO. There are multiple overlapping and, in cases, conflicting conceptualisations of SLO (e.g. Bice et al., 2017; Boutilier and Thomson, 2011; Leeuwerik et al., 2021; Moffat and Zhang, 2014; Parsons and Moffat, 2014; Prno and Slocombe, 2014; Thomson and Boutilier, 2011). Methods of measuring SLO have been developed (e.g. Boutilier and Thomson, 2011; Moffat and Zhang, 2014; Richert et al., 2015), however each relates to a particular conceptualisation, meaning they may be missing important elements and understanding. Explanatory models of SLO have been produced, such as the Narratives and Networks model in Boutilier (2020), which depicts the formation of an SLO as a process of 'socio-political churn'. These questions underpin the primary aim of this paper set out in the next subsection.

1.4. Objectives and structure

This paper aims to identify and draw together existing conceptualisations of SLO into an over-arching meta-conceptualisation. This will help to draw together disparate conceptualisations into a holistic and internally consistent framework. To do this, we will first extract the main components of SLO from the existing literature. We will then use existing conceptualisations of legitimacy and trust formation to develop a model of the process of arriving at an SLO judgement for an individual stakeholder, and the impacts of this on SLO outcomes. This model will form the basis of future empirical investigations around how SLO is gained.

2. Our approach

To address this aim the following two questions are asked.

1. What are the key components in a comprehensive descriptive conceptual framework for an individual's social licence to operate judgement formation?
2. How do these components fit together?

Answering these questions will allow the creation of a conceptualisation structured around the components and sub-components involved in determining SLO. To do this, the existing literature, drawn primarily from peer-reviewed journals with some use of books and reports, is reviewed. As the literature is large and rapidly expanding (Santiago et al., 2021) this review does not represent an exhaustive coverage of the literature, rather it focuses on literature presenting novel conceptualisations of SLO.

Following Jabareen (2009), the first step in creating a conceptual framework is to find the relevant literature. To do this, Scopus was searched on March 25, 2022 using the terms:

TITLE(("social licence" OR "social license")) AND TITLE-ABS-KEY ((conceptuali* OR framework OR model) AND (present* OR propose* OR introduc* OR novel OR new OR overarching OR combine*))

This search returned 55 results covering a period from 2007 to 2022 (with all results shown in supplementary data Table S1). Four papers

were removed in the first pass (one duplicate, two papers where full text was inaccessible, and one non-English language paper) leaving 51 results. The abstracts and titles were then manually filtered to assess whether they presented a novel conceptualisation of SLO, determined by whether they contained components or relationships absent in previous conceptualisations, leaving 30 sources. Five key conceptualisations referenced within the results that had not been returned in the Scopus search and two papers suggested by reviewers were also added (supplementary data Table S2), although we recognise that this search strategy may have excluded relevant papers.

Next, each paper was read, and all components included in the papers' conceptualisation of SLO were identified and categorised (supplementary data Table S3). These components were then deconstructed into their basic ideas, categorised by type and, where appropriate, combined to reduce the total number of components and simplified into a holistic and internally consistent framework. These were then combined with existing conceptualisations of legitimacy and trust, as these components dominated the existing conceptualisations identified, to produce an explanatory model of SLO. Finally, methods of improving SLO present within these papers were collected and categorised.

3. Results and discussion

Fig. 1 sets out the culmination of the method and models the process leading to individual SLO judgement formation and its influence on organisational outcomes. The following text will explain how the process of establishing an SLO develops, albeit the many interrelationships mean the process is unlikely to be linear. The relationships between components within the meta-conceptualisation have each been given a letter, used in the text below to explain the nature of each relationship.

3.1. Sources of information

As SLO is determined by stakeholders, it is built from individual perceptions based on the information available to them (Tarnopolskaya and Littleboy, 2015) as opposed to some objective 'truth'. The information used to build these perceptions can come from different sources. Information may come via first-hand experience, through direct impacts or being involved in the organisation's engagement (Dare et al., 2014). It may come from observable properties of a project and/or organisation (Bitektine and Haack, 2015). Alternatively, information may come from second-hand sources such as other stakeholders, who may have direct experience of the project impacts or engagement (Dare et al., 2014) or may be 'gossiping' about things they have heard (Sommerfeld et al., 2007), or independent technical reports (Billing et al., 2021; Luke, 2017; Saenz, 2019).

Other sources, such as the media, government and the judicial system, act as 'judgment validation institutions', which represent 'critical sources of validity that fundamentally influence other evaluators' judgments' (Bitektine and Haack, 2015, p. 51). This means, information about compliance with regulations and legal decisions (Bitektine and Haack, 2015; Cashmore and Wejs, 2014; Gunningham et al., 2004; Jijelava and Vanclay, 2017; Zimmerman and Zeitz, 2002) and portrayal in the media (McCrea et al., 2020) represent vital aspects of how stakeholders determine an organisation's SLO. Information may be incorrect or misleading, with sources such as the media selecting and framing viewpoints and facts (Dare et al., 2014), thus biasing the information and echoing particular viewpoints (Bice et al., 2017).

3.2. Perceptions

The information received by an individual stakeholder will be used to form two main perceptions: of the properties and behaviours of the organisation/project (link A) and of others' judgements on the organisation (link B). A stakeholder's perception of others' judgements will include their perception of what the majority opinion, or collective

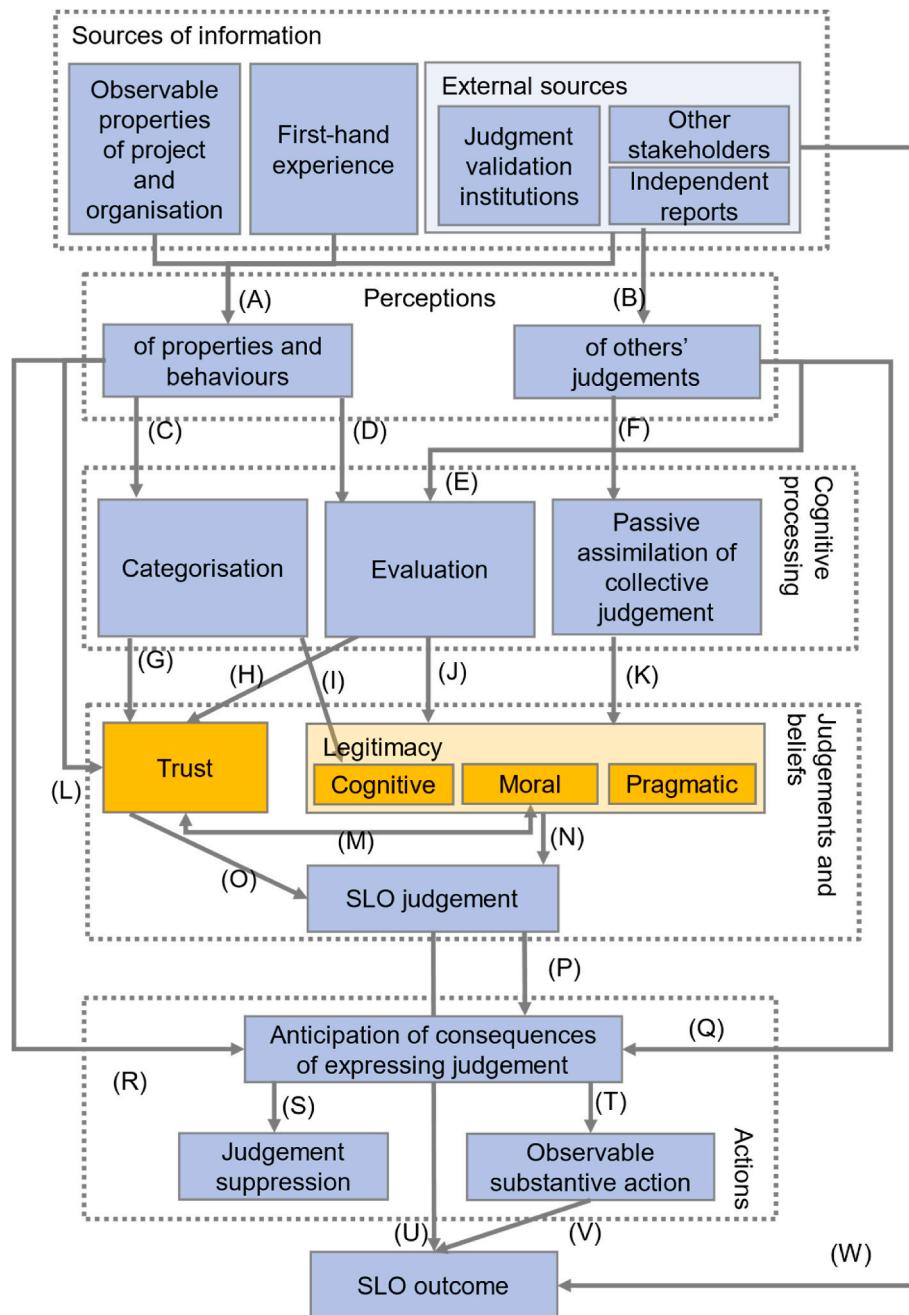


Fig. 1. Model of the process determining SLO outcomes from an individual gaining information about operations to their actions impacting the overall SLO outcome. Legitimacy and trust are highlighted as the two fundamental components of previous SLO conceptualisations.

judgement, defined as 'the extent to which there appears to be a general consensus within a collectivity that the entity is appropriate for its social context' (Tost, 2011, p. 689). The individual stakeholders' perception of the properties and behaviours of the organisation/project will include factors such as its potential impacts (e.g. Hall, 2014), which will depend on the regional and social context (Prno and Slocombe, 2014; Tarnopolskaya and Littleboy, 2015), as well as attributes of the stakeholder themselves (Measham and Zhang, 2019).

The way in which stakeholders form perceptions from available information will differ depending on their existing views and filters (Billing et al., 2021). Stakeholders select the information they use to form perceptions and thus come to different conclusions from the same information (Billing et al., 2021). Four main attributes influence a piece of information's credibility: source (Billing et al., 2021; Bozoyan and Vogt, 2016; Saenz, 2019), reliability (Bozoyan and Vogt, 2016), valence

(i.e. whether it is positive or negative) (Bozoyan and Vogt, 2016; Poortinga and Pidgeon, 2004; Tarnopolskaya and Littleboy, 2015), and fit (i.e. how well it fits in with a stakeholder's existing worldview) (Billing et al., 2021; Luke, 2017).

Stakeholders are more likely to believe information from a source close to them, or that they believe to be unbiased (Bozoyan and Vogt, 2016), for example, independent technical reports (Billing et al., 2021; Luke, 2017). Personal experience is perceived to be more reliable than 'gossip' or the repetition of other's views (Bozoyan and Vogt, 2016; Sommerfeld et al., 2007). Negative information is more salient than positive (Bozoyan and Vogt, 2016; Poortinga and Pidgeon, 2004; Tarnopolskaya and Littleboy, 2015), with negative information able to have an impact on an individual's behaviour even when from an 'untrustworthy' source (Bozoyan and Vogt, 2016). Finally, the way stakeholders perceive information will also be based on its fit with their existing

views and values (Billing et al., 2021; Luke, 2017).

3.3. Cognitive processing

Cognitive processing is an active process whereby perceptions are used to form judgements and beliefs (Bitektine, 2011; Bitektine and Haack, 2015). Cognitive processing requires mental effort (Bitektine and Haack, 2015), which humans aim to minimise while still processing the maximum amount of information (Rosch, 1978). Different methods of cognitive processing take different amounts of effort, with passive assimilation taking the least, then categorisation, then evaluation (Bitektine, 2011; Bitektine and Haack, 2015). As such, the methods used will depend on factors such as the stakeholder's motivation and interest, previous knowledge and available time (Bitektine, 2011; Bitektine and Haack, 2015).

3.3.1. Passive assimilation of collective judgement

Passive assimilation is when stakeholders simply conform to the judgement they perceive as most widely accepted (link F) (Bitektine and Haack, 2015; Tost, 2011) and represents the baseline mode of mental operations (Kahneman, 2011). As such, it will be the primary means by which individual stakeholders form judgements under conditions of organisational stability (Bitektine and Haack, 2015).

3.3.2. Categorisation

Categorisation is a rapid cognitive process in which information about an organisation is generalised based on grouping it with other, better-known, entities (Bitektine, 2011; Bitektine and Haack, 2015; McKnight, 1998). Judgements can then be made about an organisation's characteristics with very little information (McKnight, 1998). The grouping will be made based on perceptions of the organisation's properties or behaviours (link C). McKnight (1998) describe three forms of categorisation: unit grouping, stereotyping, and reputation categorisation.

3.3.2.1. Unit grouping. Unit grouping occurs when an individual puts the entity being trusted in the same group as themselves (McKnight, 1998) based on features such as shared membership of an organisation (Hurley, 2006; McKnight, 1998), common values, and traits like personality or gender (Hurley, 2006; Measham and Zhang, 2019). This creates an assumption of shared goals and values (Hurley, 2006; McKnight, 1998). This process is seen in SLO through the importance of shared experience (Thomson and Joyce, 2008), physical proximity/shared background (Billing et al., 2021), and group membership (Saenz, 2019) in determining relationships between stakeholders and organisations.

3.3.2.2. Stereotyping. Stereotyping is the placing of another entity into a general category, from which generalisations about their likely attributes are made (McKnight, 1998). This occurs within the SLO context through generalisations about an organisation based on their industry (Dare et al., 2014) or proxy factors such as the organisation's size (Baumber et al., 2019; Billing et al., 2021). This means an SLO can be impacted by the positive or negative legacy of past interactions between stakeholders and other organisations, even when they have no connection to the organisation or project in question (Prno and Slocum, 2014).

3.3.2.3. Reputation. Reputation is the assignment of attributes to another entity based on information from external sources (McKnight, 1998) about previous behaviour (Mayer and Davis, 1995). Within SLO, the impact of reputation can be seen in reduced trust for organisations that had gained a negative reputation from previous operations (Baines and Edwards, 2018) and an increased level of trust for brands that had been present in the area for longer (Baumber et al., 2019; Koivurova et al., 2015). Reputation is seen as a key determinant of SLO as it

precedes an organisation's move to an area, thus having the ability to facilitate or block operations (Parsons et al., 2014).

3.3.3. Evaluation

Evaluation is the process of actively forming opinions based on perceptions of the organisation and project's properties and behaviours (link D) (Bitektine and Haack, 2015). The collective validity judgement also impacts evaluation through contributing to decisions as to the appropriate norms to evaluate the organisation against (link E) (Bitektine and Haack, 2015). This process is influenced by the context within which the decision is being made, with attributes of both stakeholders and their external context having an impact.

3.4. Judgements and beliefs

Through cognitive processing, stakeholders form judgements and beliefs from their perceptions (Bitektine and Haack, 2015; Cassam, 2010). Particularly important to SLO are beliefs about the organisation's trustworthiness (links G and H) and judgements of its legitimacy (links I through K) (Boutilier and Thomson, 2011; de Jong and Humphreys, 2016; Leeuwerik et al., 2021; Luke, 2017). Many factors impact an individual's judgements and beliefs, for example Gifford and Nilsson (2014) highlight 18 personal and social factors that influence pro-environmental concern, including: values; political and world views; place attachment; age; gender; religion; urban-rural differences; norms; social class; impact on self; and cultural and ethnic variations.

3.4.1. Legitimacy

Legitimacy was the first element of SLO to be conceptualised (Gehman et al., 2017; Joyce and Thomson, 2000) and is present in the majority of SLO conceptualisations. Suchman (1995) poses one of the most widely accepted definitions of legitimacy (Bitektine and Haack, 2015; Gehman et al., 2017), defining it as:

'a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions' (Suchman, 1995, p. 574).

Legitimacy represents whether stakeholders deem an organisation's plans, actions, and consequences acceptable. There are multiple conceptualisations of legitimacy (Deephouse and Suchman, 2008), here we will use one based on Suchman (1995) splitting legitimacy into three categories: cognitive, based on whether the actions and presence of an organisation make sense relative to the stakeholder's worldview; pragmatic, based on whether the organisation's activities will benefit the stakeholder; and moral, based on whether the organisation's actions meet a set of moral norms.

3.4.1.1. Cognitive legitimacy. Cognitive legitimacy is present when stakeholders see an organisation or project as necessary or inevitable (Suchman, 1995) it is impacted by categorisation (link I) and assimilation of the collective judgement (link K) (Bitektine, 2011). Where an organisation has attained cognitive legitimacy, it is more able to avoid scrutiny and distrust (Leeuwerik et al., 2021). Suchman (1995) splits cognitive legitimacy into two variants: taken-for-grantedness and comprehensibility. Taken-for-grantedness relies on organisations having become such an integral part of the fabric of society that their continued presence, and often expansion, goes unquestioned (Cashmore and Wejs, 2014; Saenz, 2019; Thomson and Boutilier, 2011). Comprehensibility is determined by the extent to which a project or organisation fits into stakeholders' existing worldviews, belief systems and daily life (Suchman, 1995). Where cultural models exist to explain an organisation and its actions, its activity will be more predictable, meaningful, and inviting for stakeholders (ibid). Where organisations are trying to gain comprehensibility, they must provide logical and easily understandable explanations of how their actions make sense and fit within society

(Leeuwerik et al., 2021; Saenz, 2019; Suchman, 1995).

3.4.1.2. Pragmatic legitimacy. Pragmatic legitimacy is self-interested (de Jong and Humphreys, 2016; Saenz, 2019; Suchman, 1995), based on expected material benefits (Baines and Edwards, 2018; Suchman, 1995) and meeting the interests of the impacted party (de Jong and Humphreys, 2016). It is promoted by transactional relationships where approval is gained through monetary compensation (Baines and Edwards, 2018; Mercer-Mapstone et al., 2017). Where stakeholders rely on organisations to meet their needs, they are less likely to expect other benefits and more likely to accept negative consequences of projects (Gunningham et al., 2004; Harvey and Bice, 2014; Moffat et al., 2016).

3.4.1.3. Moral legitimacy. Moral legitimacy is judgement of whether an organisation is doing 'the right thing' (de Jong and Humphreys, 2016) based on an assessment of the activities compared to moral values and norms (link J) (Leeuwerik et al., 2021). It is socio-tropic, referring to the benefit to society as a whole rather than any particular individual (Bitektine, 2011; de Jong and Humphreys, 2016; Suchman, 1995). The norms used to determine moral legitimacy will vary between cultures and situations (link E) (Bitektine and Haack, 2015; Boutilier and Thomson, 2011) as well as personal factors. Taking gender as an example from the list of factors affecting judgements in section 3.4, women have been found to: be more altruistic (Dietz et al., 2002 *per* Measham and Zhang, 2019); rank environmental concerns more highly (Gifford and Nilsson, 2014 *per* Measham and Zhang, 2019); have greater moral conviction against mining (Measham and Zhang, 2019). Moral legitimacy can broadly be split into consequential legitimacy, which relates to whether the impacts are seen as acceptable and good, and procedural legitimacy, which is whether the organisation/project is seen as following socially acceptable methods (Suchman, 1995).

3.4.1.3.1. Consequential. Consequential legitimacy is determined by whether impacts are acceptable or good, representing a teleological view of legitimacy (Reeder, 2022). Within SLO, issues of moral consequential legitimacy focus on two dimensions of consequences. The first is the impacts themselves, whether this be provision of economic benefits (MacPhail et al., 2022), noise pollution (Hall, 2014), impacts on social infrastructure (Moffat et al., 2016), or the destruction of a sacred site (Thomson and Boutilier, 2011). The second focuses on whether the distribution of impacts is fair and just (Baumber et al., 2019, 2021; Dare et al., 2014; França Pimenta et al., 2021; Lesser et al., 2021; MacPhail et al., 2022; Moffat et al., 2016; Thomson and Boutilier, 2011) with authors variably focussing on equity (e.g. Baumber et al., 2021; Lesser et al., 2021) or equality (e.g. Thomson and Boutilier, 2011) as desired outcomes. Where distributional fairness has not been considered, marginalised communities often experience the costs of a project while benefits go to relative elites (MacPhail et al., 2022).

3.4.1.3.2. Procedural. In some cases, results may be difficult or impossible to measure directly, for example due to being in the future, ambiguous or high stochasticity (Suchman, 1995). Where this occurs, the legitimacy of actions can be assessed against how well they follow socially accepted techniques and procedures, which confer procedural legitimacy, implying the organisation is making an effort in good faith to achieve difficult to measure ends (Suchman, 1995). This focus on the means as opposed to the ends follows deontological ethics (Roby, 2018). As a concept, procedural legitimacy is included in many conceptualisations of SLO under the names procedural fairness (e.g. Baumber et al., 2021, 2019; de Jong and Humphreys, 2016, 2016; França Pimenta et al., 2021; Luke, 2017; Moffat and Zhang, 2014; Saenz, 2019) and procedural justice (Heffron et al., 2021; Luke, 2017). Perceived procedural fairness has been found to be of greater importance to stakeholders than the impacts a project has on social infrastructure (Moffat and Zhang, 2014), potentially mediated by its impact on trust (link M) (ibid).

Stakeholder inclusion in the decision-making process is a key aspect

of procedural legitimacy (Leeuwerik et al., 2021). This is difficult as there is still much discussion about which stakeholders should be included (Boutilier, 2020) and, even within legitimate stakeholders, there may be competing demands (Koivurova et al., 2015) which must somehow be weighted (Moffat et al., 2016). One key issue here is recognition justice, which 'requires that the values, worldviews, and lifeways of all peoples be acknowledged and respected' (MacPhail et al., 2022, p. 5), particularly important when working with Indigenous peoples, who have a recognised right to self-determination (de Jong and Humphreys, 2016; Heffron et al., 2021).

How the decision is made is also important, sometimes called 'throughput legitimacy' (Risse and Kleine, 2007). Stakeholders must be able to meaningfully participate in the decision-making process (Hall, 2014; Heffron et al., 2021; Koivurova et al., 2015; MacPhail et al., 2022). Requiring that stakeholders have access and opportunity (Baumber et al., 2021; Heffron et al., 2021; MacPhail et al., 2022) as well as the time (Billing et al., 2021) and confidence to express their views (MacPhail et al., 2022). Alongside this, there must be institutional capacity to listen (MacPhail et al., 2022) and a lack of bias from decision makers (MacPhail et al., 2022) including not having a pre-determined outcome (Hall, 2014; Moffat et al., 2016).

Stakeholders may also assess the other information used in decision-making, often requiring information from independent technical reports to be available and utilised before accepting a project (Billing et al., 2021; Luke, 2017; Saenz, 2019). Further, decision making requires transparency (Baumber et al., 2021; Leeuwerik et al., 2021; MacPhail et al., 2022; Prno, 2013). This requires access to and provision of information (Billing et al., 2021; Heffron et al., 2021; MacPhail et al., 2022; Prno, 2013), particularly for those impacted (MacPhail et al., 2022) including clarity about potential risks (Leeuwerik et al., 2021). This allows organisations and stakeholders to build a common future vision (Leeuwerik et al., 2021).

3.4.2. Trust

Trust is defined as a willingness and intention to accept vulnerability to risk or loss through the actions of another, based on positive expectations of their intentions and behaviour (Kim et al., 2004; Thomson and Joyce, 2008). In this way, trust 'refers to the future, builds on the past and is continually reproduced in the present' (Bachmann and Zaheer, 2013, p. 275). Violating the expectations trust is built upon, for example taking advantage of a vulnerable stakeholder (de Jong and Humphreys, 2016) can lead to 'negative relational consequences' (Moffat and Zhang, 2014, p. 62). Trust consists of a stakeholder judgement of their vulnerability and their trusting beliefs, that is their beliefs of whether the organisation has attributes that mean they will carry through on their promises (Mayer and Davis, 1995; McKnight, 1998). Trust impacts stakeholders' perceptions of fairness (Bianchi and Brockner, 2012), contact quality and the acceptability of decisions (Moffat and Zhang, 2014), all aspects of legitimacy (link L). Thus, having a high level of trust is likely to substantially increase an organisation's ability to gain an SLO.

3.4.2.1. Vulnerability. A stakeholder's decision to trust will be based on how vulnerable they judge themselves to be, in situations of greater vulnerability they will require a greater level of trusting beliefs in order to trust the organisation (Hurley, 2006; Mayer and Davis, 1995). Vulnerability will be based on a combination of the extent of the perceived impacts (link L), the amount of risk a stakeholder is willing to be subjected to (Hurley, 2006), and the stakeholder's power (Hurley, 2006). Power may come from stakeholder attributes, such as wealth (Boutilier, 2020), or local enabling factors and legislation (Gunningham et al., 2004; Wilson, 2016). An individual's confidence in the governance structures surrounding the project will increase their perceived power (Moffat et al., 2016; Prno, 2013; Zhang and Moffat, 2015). This is based on the regional political context, such as institutional capacity,

and the stakeholder's perception of the government's ability and motivations (Lesser et al., 2021). Where stakeholders believe the government to have poor capacity (Zhang and Moffat, 2015) or a regulator to be overly 'pro-development' (Prno and Slocombe, 2014) they are less likely to trust their interests are being adequately protected (Lesser et al., 2021), and more likely to reject the project on the grounds of not being certain enough they will not be harmed (Zhang et al., 2015).

3.4.2.2. Trusting beliefs. The three trusting beliefs are: ability, whether an organisation is believed to have the skills to carry out its promises; benevolence, whether the organisation is believed to be willing to disadvantage themselves to benefit others; and predictability and integrity, whether the organisation is believed to be adhering to an acceptable set of principles (Mayer and Davis, 1995; McKnight, 1998). These beliefs are formed based on categorisation (link G) (Bitektine, 2011; Dare et al., 2014; Mayer and Davis, 1995; McKnight, 1998; Prno and Slocombe, 2014) and evaluation (link H) (e.g. Saenz, 2019; Leeuwrik et al., 2021).

3.4.2.2.1. Ability. To carry through on their promises, organisations must have the required skills (both technical and interpersonal) and knowledge (Butler and Cantrell, 1984; Mayer and Davis, 1995). Within the SLO literature, this is generally captured as 'competence-based trust' (de Jong and Humphreys, 2016; Moffat and Zhang, 2014). This belief is specific to the organisation's expertise (Mayer and Davis, 1995). When organisations are working with stakeholders from a very different cultural background, ability will include beliefs about the organisation's understanding of local norms and cultural values (Harvey and Bice, 2014).

3.4.2.2.2. Benevolence. Benevolence is an inclination to be kind, often including putting others' needs before your own (Hurley, 2006). This belief is represented in SLO as questions about whether the organisation has 'our best interests in mind' (Thomson et al., 2010, p. 16). This may be shown through respect and consideration for welfare (Moffat and Zhang, 2014) and allowing local agency (Hall, 2014) through sharing power (Thomson and Boutilier, 2011), collaboration and providing opportunities (Thomson and Joyce, 2008) and acting on concerns, not just listening (Dare et al., 2014). This covers many of the elements of procedural legitimacy and, as such, meeting the requirements of procedural legitimacy will contribute to whether a stakeholder chooses to trust the organisation (link M).

3.4.2.2.3. Predictability and integrity. Predictability and integrity revolve around the belief that the trustee is adhering to an acceptable set of principles (Butcher, 2019; de Jong and Humphreys, 2016; Mayer and Davis, 1995, p. 719; Moffat and Zhang, 2014). It is no good believing in an organisation's ability and benevolence if their actions are unpredictable (Hurley, 2006). This also broadly covers the conceptualisations of credibility within SLO, in which the organisation 'is seen as following through on promises and dealing honestly with everyone' (Thomson and Boutilier, 2011, p. 1785). This requires organisations to be seen as truthful and honest (de Jong and Humphreys, 2016), keep promises (Harvey and Bice, 2014; Prno, 2013), meet expectations (Moffat and Zhang, 2014) and be transparent about their interests and motivations (Baines and Edwards, 2018; Harvey and Bice, 2014; Saenz, 2019). Organisations must also act on concerns as they arise (Dare et al., 2014), take responsibility for failures (Baumber et al., 2019), and accept fault when necessary (Heffron et al., 2021).

3.4.3. SLO judgement

The formation of an SLO judgement likely requires both trust (link O) and legitimacy (link N). Boutilier and Thomson (2011) argue that SLO can be gained without trust, through achieving 'economic legitimacy', which has many parallels with pragmatic legitimacy. This contradicts other accounts, which find trust to be a key component of SLO, contributing to the establishment of legitimacy (Moffat and Zhang, 2014). It is likely that different judgements and beliefs are important to

different stakeholders (Lesser et al., 2021), for example, a directly impacted stakeholder is more likely to be concerned about the benefits they will receive than a distant stakeholder (Lesser et al., 2021).

A stakeholder's judgement of an organisation's SLO is not binary, and is generally conceptualised as falling into one of four levels: withdrawal, whereby an SLO has not been granted; acceptance, where stakeholders do not object to the organisation or project; approval, where stakeholders view the project favourably; and psychological identification, where stakeholders believe that the company will always act in the community's best interests and share responsibility for a project's success (Thomson and Boutilier, 2011). It is also likely that beyond withdrawal, stakeholders can begin to accept or identify with the opposition to an organisation or project, further solidifying their disapproval (Luke, 2017).

3.5. Actions

Once a judgement has been formed, the stakeholder must decide whether they will externalise, potentially impacting the world around them (Bitektine and Haack, 2015; Boutilier, 2020). This decision is based on the potential consequences of expressing the judgement and will result in the judgement either being suppressed (link S) or expressed through observable substantive actions (link T) (Bitektine and Haack, 2015).

3.5.1. Anticipation of consequences of expressing judgement

Stakeholders are able to assess the likely consequences of publicly expressing their judgement (link R) (Bitektine and Haack, 2015). This will be based on the judgement itself (link P) and whether it differs from their perception of collective judgement (link Q) (Bitektine and Haack, 2015) as well as perceptions of the organisation (link R), such as the likelihood of sanctions or violent suppression of their views (Bitektine and Haack, 2015; de Jong and Humphreys, 2016). The impacts of expressing judgements need not only come from authorities, but may also act through other means such as media backlash or ostracization by peers (Bitektine and Haack, 2015). These impacts will be dependent on stakeholder attributes such as power (Bitektine and Haack, 2015; Hurley, 2006). Stakeholders will also assess how likely expressing their judgement is to cause change, i.e., the positive consequences of expressing their judgement. A likely example of this found in SLO are industry phase effects, in which people are more likely to reject a project during the pre-approval phase as there is a unique and relatively low cost opportunity to say no, relative to once the project is operational (McCrea et al., 2020).

3.5.2. Judgement suppression

Where stakeholders deem the likely negative impacts of expressing their judgement outweigh the positive impacts, their judgement will be suppressed (link S) (Bitektine and Haack, 2015). Some people are simply more risk averse, and so may be less likely to risk negative consequences (Hurley, 2006). This process can lead to marginalised stakeholders feeling unable to express their judgements (Moffat et al., 2016).

3.5.3. Observable substantive action

Where stakeholders judge the benefits of expressing their opinion to outweigh the costs, they will externalise it through an observable substantive action (link T) (Bitektine and Haack, 2015). The methods of externalising judgements that are available to a stakeholder depend on stakeholder power, local enabling factors (Wilson, 2016) such as a political context designed for procedural empowerment (Gunningham et al., 2004), and historical context (Nyembo and Lees, 2020).

3.6. SLO outcome

The level of SLO depends on the SLO judgement of the individual stakeholder (link U) and the SLO judgements of other actors (link W).

There is little agreement on exactly whose views matter when considering an SLO (Boutilier, 2020), however it is generally considered that some semblance of a consensus is required (Harvey and Bice, 2014). Whether or not operations go ahead is impacted by the stakeholder's actions (link U) and the actions of other stakeholders (link V) as well as external contextual factors (Boutilier, 2020; Prno and Slocombe, 2014). Depending on the nature of stakeholders' actions, they may impact the organisation directly, for example through protest (de Jong and Humphreys, 2016; Franks et al., 2014; Hanna et al., 2016; Vanclay and Hanna, 2019), or indirectly through influencing the collective judgement (Bitektine and Haack, 2015). Regional context, such as changeable economic conditions, may also impact operations irrespective of whether or not SLO has been granted (Prno and Slocombe, 2014).

The four potential SLO outcomes are shown in Fig. 2. Where the SLO and operational status are coupled (Fig. 2: top right and bottom left quadrants), it can be seen as generally good for the stakeholders as their demands and wishes have been met. Where there is a mismatch between SLO and operational status (Fig. 2: top left and bottom right quadrants), it can be seen as negative for the stakeholders. Operations may have positive SLO with the stakeholder but be halted for some other reason (Fig. 2, bottom right quadrant), such as the actions of other stakeholders (e.g. Boutilier, 2020) or external economic pressures (e.g. Prno and Slocombe, 2014; Thomson and Boutilier, 2011). Alternatively, the stakeholder may choose not to or be unable to act on their negative SLO judgement in a way that halts operations (Fig. 2, top left quadrant) (e.g. Syn, 2014), particularly when there are substantial power imbalances, including the threat and use of violence (de Jong and Humphreys, 2016).

For an organisation, assuming the operations going ahead is a desirable outcome, any situation in which they are halted is negative (Fig. 2, bottom two quadrants). Where operations go ahead with positive SLO, it is good for the organisation (Fig. 2, top right quadrant). Where operations go ahead with negative SLO (Fig. 2, top left quadrant) it is less clear, as although operations may still be profitable, allowing the organisation to gain from continued operations, negative SLO can bring with it considerable costs and operational risk (Hall, 2014; Jijelava and Vanclay, 2014; Miller, 2014), so is likely to be worse for the organisation than operating with a positive SLO.

The SLO outcome will feed back into individual's decision-making process through providing new information, such as whether the organisation met expectations (Moffat and Zhang, 2014). This process allows stakeholders to continually assess the SLO of the organisation/project (Leeuwerik et al., 2021).

4. Conclusion

This paper provides an explanatory model for how individual stakeholders come to SLO judgements and how these may impact the operations of a project or organisation, building upon existing component-based (e.g. Moffat and Zhang, 2014) and process-based (e.g. Boutilier, 2020) conceptualisations of SLO. In doing so, it highlights how stakeholders can impact operations, and the importance of supporting marginalised stakeholders such that they are able to express their judgements and practice their right to self-determination. The model is not intended to quantify how SLO might be achieved through facilitating proportional allocation of the various elements included. Rather, it is designed to highlight the complexity associated with gaining SLO and to highlight the myriad of factors that organisations need to consider. It is anticipated that the importance of different elements will be context dependent meaning learning from a variety of disparate cases will be required to determine whether there are co-dependencies between factors that will assist organisations planning for the SLO. Once this has been achieved, this model will provide a means by which organisations can consider how their actions may impact SLO judgement formation, thus allowing for better project planning and outcomes.

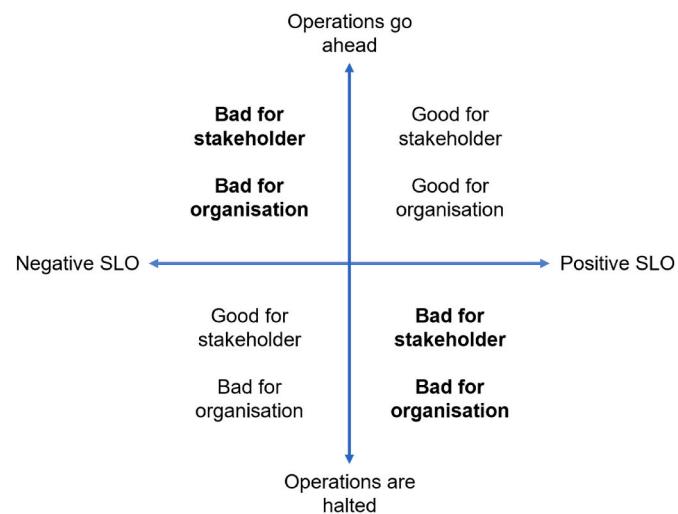


Fig. 2. The four potential SLO outcomes, adapted from Prno and Slocombe (2014). SLO outcomes have two dimensions, whether SLO was granted (x-axis) and whether operations go ahead/continue (y-axis), each quadrant represents one of the four outcomes, with the text inside showing its relevance to the community and organisation. Quadrants in which the SLO judgements and operational outcomes are uncoupled have been highlighted with bold text.

Author contributions

Alice Stuart: Conceptualisation, Methodology, Investigation, Data Curation, Visualisation, Writing – Original draft preparation, Writing - Review & Editing. **Alan Bond:** Conceptualisation, Writing - Review & Editing, Supervision. **Aldina Franco:** Conceptualisation, Writing - Review & Editing. **Julia Baker:** Conceptualisation, Writing - Review & Editing. **Chris Gerrard:** Conceptualisation, Writing - Review & Editing. **Vittoria Danino:** Conceptualisation, Writing - Review & Editing. **Kylie Jones:** Conceptualisation, Writing - Review & Editing.

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Anglian Water Services Ltd were consulted on the conceptualisation and assisted with proof editing of the manuscript. Neither the National Environmental Research Council nor ARIES DTP were involved in the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data are included in the supplementary tables in the attached file and are also available on FigShare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.resourpol.2023.103962> as downloadable file (with article) and also on FigShare..

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How England got to Mandatory Biodiversity Net Gain: A Timeline.

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Abstract

Biodiversity net gain (BNG) is a ‘net outcome’ planning policy which aims for developments to leave biodiversity in a better state than before they started. Mandatory biodiversity net gain, the English policy introduced through the Environment Bill (2021), became a mandatory requirement for most terrestrial and intertidal developments in February 2024. The policy uses habitat attributes as a proxy for biodiversity and represented the widest reaching net outcome policy in the world at the point of its introduction. As such, is expected to have a significant impact on future land use decisions in England. Understanding the origins and history of mandatory BNG is necessary to understand the drivers and barriers that have influenced the policy to date and could inform the development and implementation of future BNG policies elsewhere in the world. This paper uses a mixture of literature review and the knowledge of those involved in the early stages of BNG policy development in England to present a timeline of the stages that have led to mandatory biodiversity net gain. In doing so, we highlight formative events and documents, as an important first step in understanding its history and understanding how this can be used to inform future biodiversity policy.

Introduction

Net outcome policies are based on a relatively simple premise: that development should aim to achieve an overall ‘no net loss’ or a ‘net gain’ in biodiversity. This extends policy beyond the mitigation hierarchy embedded in Environmental Impact Assessment (EIA) by requiring residual biodiversity losses that are not ecologically irreplaceable to be at least fully compensated for (Bull *et al.*, 2020). This, in theory, allows for continued development while maintaining a neutral or positive overall impact on biodiversity, which is essential if both socioeconomic and ecological targets are to be met (Spaiser *et al.*, 2017; Hickel, 2019). In response to this, many governments and organisations have begun to adopt net-outcome style policies (Griffiths *et al.*, 2019; zu Ermgassen *et al.*, 2021), with sub-national policies also existing in multiple countries including the UK, Australia, the USA, Canada, and France (zu Ermgassen *et al.*, 2019).

Biodiversity Net Gain (BNG) is a net outcome planning policy which has a variety of definitions, including developments designed to make their “impact on the environment positive, delivering improvements through habitat creation or enhancement after avoiding or mitigating harm as far as possible” (Defra, 2018c, p. 13), and “development that leaves biodiversity in a better state than before. It is also an approach where developers work with local governments, wildlife groups, land owners and other stakeholders in order to support their priorities for nature conservation” (CIEEM, CIRIA and IEMA, 2016, p. 2). In England, BNG policy was outlined in the Environment Act (2021) and requires developments within the scope of the policy to demonstrate they will achieve an at least a 10% increase in biodiversity units from pre-development before construction can begin. The policy became mandatory on February 12th 2024 (Natural England, 2024) for the vast majority of developments falling under the Town and Country Planning Act (1990) (i.e., almost all residential, commercial, and mining related construction), and is anticipated to come into force for Nationally Significant Infrastructure Projects (NSIPs) in late 2025. Given the scope of developments for which BNG is already mandatory and the NSIPs to which it is intended soon to apply, the policy is likely to influence significant decision-making on the use of land both for those undertaking regulated developments and those interested in providing biodiversity units and in England.

Documenting the development of BNG in England is an important step in understanding the drivers and constraints that have led to the policy looking as it does today, as well as how this may impact both its implementation in England and the development of future net outcome policies globally.

Having a chronicle of formative events and/or policies provides the basis for other researchers, government, and industry professionals to identify the drivers and barriers that can be addressed to support the development of BNG policy elsewhere, as well as understand how to implement future interventions and changes to improve outcomes in England as experience develops. This article, therefore, presents a timeline of the steps leading to the introduction of mandatory BNG in England, representing a first step towards properly understanding its history. In doing so, it collates knowledge of many of the interventions that have established BNG in England and provides a collection of key sources relating to it.

In developing the timeline, it is inevitable that linkages between recent events and the development of current BNG policy are easier to identify compared to those further back in time for which more inferences need to be drawn. To reflect the changing policy landscape, the timeline is divided into seven policy stages:

- 0) Before 1992, most conservation policies focus on the protection of specific habitats and species, a small number of national offsetting policies arise.
- 1) From 1992 to 2006, characterised by a global recognition of the need to improve biodiversity outcomes and the inclusion of biodiversity, as opposed to specific protected habitats, in English planning policy, underpinning the future development of specific BNG policy.
- 2) From 2007 to 2014, characterised by increasing recognition of the value that biodiversity affords human beings, particularly through ecosystem services, in the UK which was reflected in a move to an ecosystems-based approach in England
- 3) From 2014 to 2016, characterised by a more bottom-up approach to the development of BNG approaches and good practice, led by industry.
- 4) From 2016 to 2019, characterised by Brexit providing the context for the revision of UK environmental protections.
- 5) From 2019 to 2021, characterised by the passage of the Environment Bill through Parliament.
- 6) From 2022 to the time of writing, characterised by preparation for, and the implementation of, mandatory BNG in England.

Methods

This timeline has been produced in two stages. Initially, a broad timeline was produced using the information available in key documents and government reports on BNG found through previous research on BNG, mainly regarding the initial 2018 Defra consultation on net gain ([e.g. Defra, 2018](#)) and related documents. These sources were then supplemented by taking a snowballing approach, following references from the identified sources and investigating events and reports mentioned in any relevant literature. The dates of any events and documents directly relevant to BNG in England were recorded in a table and a note was made of their relevance, primarily consisting of changes to legislation, mention of future dates and events, or approach to BNG that were mentioned within the documents. At this point, the timeline was split into the six sections between 1992-the present presented here, both to increase the accessibility of the document by splitting the timeline into smaller documents, and to highlight perceived shifts in approach to biodiversity leading to mandatory BNG in England. A summary paragraph was written for each section of the timeline to allow the reader to quickly determine relevance without need to read every event.

After developing this initial understanding, consultation was undertaken with academics and practitioners involved in BNG in England. This approach helped to identify additional drivers, events, and interpretations not well documented in the literature, additional people to consult. It was during this stage that the pre-1992 section was added in recognition of the importance of early international policies that set the context for BNG in England. In addition to this, international context was added to the summary paragraphs at the start of each timeline section where relevant. All people consulted have had their contribution acknowledged, either through authorship or within the acknowledgements section. Where information has been included based on the personal knowledge and experience of those involved in the policy evolution, as opposed to a more referenceable source, it has been highlighted in italics to make the provenance clear.

Timeline

An overview of the stages involved in the development of English BNG policy are shown in Figure 1, a further stage 'zero' has been included to provide the context of early biodiversity policy.

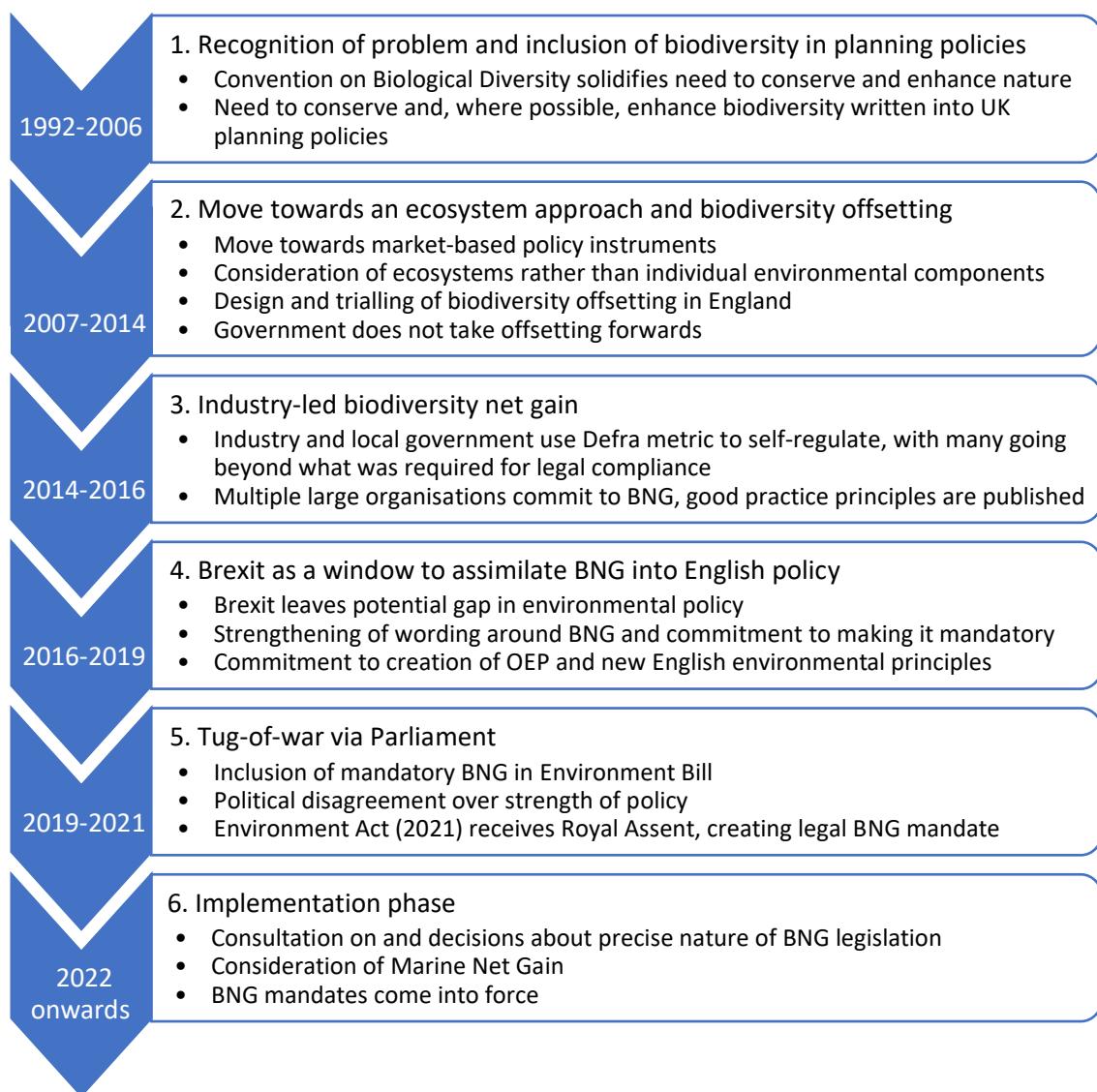


Figure 1: Summary of stages in English BNG policy development

0) Pre-1992: Early biodiversity policies

Early biodiversity policies focussed on specific places and landscapes, for example the Yellowstone National Park Act (1872), considered to be the first case of an area being formally protected in law with a primary purpose of preserving nature (U.S. National Park Service, 2020) and, in the UK, the protection of designated areas, initially through the National Parks and Access to the Countryside Act 1949. Later came policies designed to protect species, such as the Clean Water Act in 1972 (Hines, 2012) and Endangered Species Act in 1973 in the USA, as well as the Birds Directive in 1979 (European Commission, 2024) in the EU. Subsequently, in recognition of the extent to which development is a leading cause of biodiversity loss, multiple countries brought in offsetting-style policies; namely Germany, which introduced national mandatory biodiversity offsetting in 1976 (Tucker, 2016), and the US, where no net loss was suggested as a goal for US wetlands policy at the National Wetlands Policy Forum in 1987 and adopted into policy in 1989 (Heimlich *et al.*, 1998).

1) 1992 to 2006: Biodiversity enters planning policy

During this period, there is increasing concern about the implications of continued biodiversity loss and the need to halt and, where possible, reverse this. Following the Convention on Biological Diversity in 1992 (United Nations, 1992), the UK adopted a biodiversity action plan and considered using the planning system to minimise harm caused by development and, where possible, use it to enhance biodiversity. Elsewhere, no net loss continued to be adopted as a biodiversity policy, for example, in the states of New South Wales, Victoria and Western Australia in Australia 2002 and 2003 (REF). Also during this time, interesting in offsetting within the private sector increases (e.g. ten Kate, Bishop and Banyon, 2004) leading to the founding and first meeting of the Business and Biodiversity Offsets Programme in 2004 (BBOP, 2018).

Year	Month	Event	Relevance to BNG
1992	May	Convention on Biological Diversity (United Nations, 1992)	<ul style="list-style-type: none">• Recognised need for nations to conserve and enhance biodiversity• Identified need for global scientific ecosystem assessment• UK sign up, committing to conserve and protect existing biological diversity, and to enhance it wherever possible, including drawing up a national biodiversity plan
1994	January	UK Biodiversity Action Plan published (Department of the Environment, 1994)	<ul style="list-style-type: none">• Required by Convention on Biological Diversity (1992)• Recognition of need “to ensure the conservation and, where possible, the enhancement of biodiversity within the UK” (p. 3)• Set priority species and habitats
1995	July	The Environment Act 1995 (Environment Act, 1995)	<ul style="list-style-type: none">• Created the Environment Agency and some provisions for “the conservation of natural resources and the conservation or enhancement of the environment” (p.1)
2000	April	UN announce The Millennium Ecosystem Assessment (Annan, 2000)	<ul style="list-style-type: none">• Announced by UN Secretary-General Kofi A. Annan• Intended to provide scientific evidence for future policy

	May	COP-5 adopts the ecosystem approach and defines principles for its use (United Nations, 2000)	<ul style="list-style-type: none"> Defines the ecosystem approach as “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.” (Annex A) Makes a call for governments and organisations to use the ecosystem approach as appropriate Makes it clear that the “ecosystem approach does not preclude other management and conservation approaches” (Annex A) Provides principles for the use of the ecosystem approach (Annex B)
	November	Countryside and Rights of Way Act (Countryside and Rights of Way Act, 2000)	<ul style="list-style-type: none"> Required the Minister of the Crown, Government departments, and the National Assembly for Wales “to have regard ... to the purpose of conserving biological diversity in accordance with the Convention [on Biological Diversity of 1992]” (Part III, Section 74.1) Created duty to publish lists of habitats and species of principle importance and take and promote “reasonably practicable” steps “to further the conservation of the living organisms and types of habitat included in [said lists]” (Part III, Section 74.3)
2002	October	Defra publish “Working with the grain of nature” a new biodiversity strategy for England (Defra, 2002)	<ul style="list-style-type: none"> Set the aim to “ensure that construction, planning, development and regeneration have minimal adverse impacts on biodiversity and enhance it where possible” (p. 53) Suggests action towards “[p]lanning policies and development decisions that recognise the need to conserve and enhance biodiversity.” (p. 57)
2005	January	Planning Policy Statement 1: Delivering Sustainable Development (Office of the Deputy Prime Minister, 2005a)	<ul style="list-style-type: none"> Set out that planning authorities “should seek to enhance the environment as part of development proposals” (para. 19) Included the “polluter pays” principle (para. 19) setting out that organisations should pay to remediate their environmental externalities
	March	UN Millennium Ecosystem Assessment (MEA) published (Millennium Ecosystem Assessment, 2005)	<ul style="list-style-type: none"> Influenced thinking in the UK, leading to the UK NEA (Waylen and Young, 2014)
	August	Planning Policy Statement 9: Biodiversity and Geological Conservation (Office of the Deputy Prime Minister, 2005b)	<ul style="list-style-type: none"> Included ensuring that biodiversity is conserved and enhanced as “an integral part” of development as a key Government objective for planning (Page 2) Reiterated that “Plan policies and planning decisions should aim to maintain, and enhance, restore or add to biodiversity”

2006	March	Natural Environment and Rural Communities Act (Natural Environment and Rural Communities Act 2006)	<ul style="list-style-type: none"> Creates more general duty to conserve biodiversity (section 40), updating that previously set out in the (<i>Countryside and Rights of Way Act, 2000</i>), to require that “[e]very public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity” (p. 14)
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2) 2007-2014: Nature as offset-able ecosystems

This period saw a move towards treating biodiversity as ecosystems as opposed to its individual parts, including the assessment of UK and English ecosystems, the state they are in, and the economic value they confer. Throughout this period, the Government commission significant amounts of research on ecosystems, biodiversity offsetting and biodiversity markets. Biodiversity offsetting is scoped and trialled as a policy option in England to see if it could more efficiently and effectively deliver existing biodiversity planning and consent processes, accompanied by a political push for market-based conservation methods. The UK Government introduce a no net loss objective and net gain aim. During this period, considerable information exchange occurs between the UK policy makers and other countries with established offsetting policies through conferences and meetings. A considerable media push-back occurs against offsetting as a policy. Elsewhere, other countries continue to adopt net outcome policies, notably in Europe, with the European Parliament calling for No Net Loss regulation using BBOP standards in 2012 (BBOP, 2018); the European Commission consultation on no net loss is 2014 (European Commission, 2014); and France introducing NNL into guidance developed in 2012/13, and into law in 2016 (Vaissière *et al.*, 2018).

Year	Month	Event	Relevance to BNG
2007	January	House of Commons Environmental Audit Committee review the MEA (Environmental Audit Committee, 2007b)	<ul style="list-style-type: none"> Reiterates needs for companies to internalise their environmental impact Recommend that the government assess UK ecosystems to identify and develop effective policy responses (para. 30)
	June	UK Species and Habitat Review concludes (Biodiversity Reporting and Information Group (BRIG), 2007)	<ul style="list-style-type: none"> Updated UK BAP priority species and habitats
	July	Government response to Environmental Audit Committee's review of MEA (Environmental Audit Committee, 2007a)	<ul style="list-style-type: none"> Early mention of the need for metrics for ecosystem services to aid in internalising business externalities (p. 6) References the upcoming Defra Ecosystems Approach Action Plan as a solution to better valuation of ecosystem services (p. 13) References that work on “status and trends in England’s terrestrial ecosystems, and the goods and services they provide” (p. 17) is being done

	October	Defra and UK Biodiversity Partnership publish 'Conserving Biodiversity – The UK Approach' (Defra and UK Biodiversity Partnership, 2007)	<ul style="list-style-type: none"> Designed to provide a strategic framework for conserving biodiversity in the UK in the light of changing pressures and increasing devolution Pushes the importance of the ecosystem approach as decided in COP-5 (United Nations, 2000) Discusses the importance of targeting action to priority species and habitats and embedding “proper consideration of biodiversity and ecosystem services into all relevant sectors of policy and decision-making” (p.10)
	December	Defra publish Ecosystems Approach Action Plan (Defra, 2007)	<ul style="list-style-type: none"> Cohesive ecosystems-based approach rather than considering environmental elements in separate policies Identified a need to explore new policy options for ecosystem conservation, possibly including the creation of a market in biodiversity or new incentives for biodiversity “such as biodiversity offsets”, particularly to reduce the loss of non-designated sites and features (Treweek, 2009)
2008	Early	Results of Defra-commissioned scoping study for UK MEA-style ecosystem assessment published (Haines-Young <i>et al.</i>, 2008)	<ul style="list-style-type: none"> Suggests that it would be possible and would provide benefits but may be too expensive if not mainly built off of existing research.
	Unknown	Defra commission a scoping study for the design and use of biodiversity offsets in an English context (Treweek, 2009)	<ul style="list-style-type: none"> Sought to use offsetting fulfil duties under the Countryside and Rights of Way Act (2000), the Natural Environment and Rural Communities Act (2006) and associated planning policy Find how offsets could be set up in the UK and how this would fit with current legislation
2009	Unknown	BBOP Principles, Handbooks, Resource Papers, Glossary and Case Studies published (e.g. BBOP_2009b, 2009a)	<ul style="list-style-type: none"> Marked completion of Phase I of BBOP's work Provided an international best practice for biodiversity offsetting Suggested the use of different metrics (inc area based; area x quality; species density and occupancy) depending on context Principles state that projects using offsets should follow the mitigation hierarchy, recognise that some biodiversity is irreplaceable, ensure offsets result in both additional conservation outcomes that are secured for at least the lifetime of the project and equitable social outcomes based on stakeholder engagement, and both science and traditional knowledge.
	April	Results of English offsetting scoping study published (Treweek, 2009)	<ul style="list-style-type: none"> Found that “biodiversity offsets are unlikely to be implemented to any great extent under current EU law and associated regulations” (p. 3) Suggested more consideration into whether new regulation would be required to ensure a regular and consistent ‘no net loss of biodiversity’

		<p>requirement for development and systems for trading biodiversity credits</p> <ul style="list-style-type: none"> • Suggested need for a series of pilot projects • Put forward a habitat-based metric calculating units as <i>area (ha) x distinctiveness x condition</i>, later used in the 2012 Defra offsetting pilots
	mid-year	<p>UK National Ecosystem Assessment commences as part of the Living With Environmental Change (LWEC) initiative (UNEP WCMC, 2009)</p> <ul style="list-style-type: none"> • Was expected and initiated to produce evidence that could be used to inform future policy (Waylen and Young, 2014)
	Sept	<p>Lawton Review commissioned (Lawton <i>et al.</i>, 2010, p. ii)</p> <ul style="list-style-type: none"> • Commissioned by Hilary Benn, the then Secretary of State in the Department for Environment, Food and Rural Affairs, to review whether England's wildlife sites were capable of adapting to climate change and other land uses
2010	January	<p>Possible methods for measuring biodiversity losses and gains for use in the UK published (Treweek, Butcher and Temple, 2010)</p> <ul style="list-style-type: none"> • Requires an ecosystem approach to value areas as a whole rather than their individual components • Recommended a minimum of 1:1 ratio of area of compensation to area of habitat lost • Recognised that some important attributes would not be captured by a habitat-based system
	April	<p>Conservative party release election manifesto (Conservative Party, 2010)</p> <ul style="list-style-type: none"> • Discusses a move away from "rules and regulations to impose a centralised worldview" to "new incentives and market signals" (p. 89) • Includes proposal for the increasing the "market for green goods and services" (p. 89) and "a new system of conservation credits to protect habitats" (p. 96)
	May	<p>UK general election results in a Conservative-Liberal Democrat coalition (Rhodes, McGuinness and Cracknell, 2011)</p> <ul style="list-style-type: none"> • Conservatives win the most seats but do not gain a parliamentary majority • Allows Conservatives to begin enacting their proposed environmental policies
	July	<p>Defra publish discussion document in advance of 2011 White Paper (Defra, 2010a)</p> <ul style="list-style-type: none"> • Suggests biodiversity offsetting to increase the role of 'Big Society', as opposed to 'Big Government', in ensuring sustainable natural resource use
	September	<p>Lawton review published (Lawton <i>et al.</i>, 2010)</p> <ul style="list-style-type: none"> • Suggested four main principles for improvement: bigger, better, more, and joined up • Suggested the need for considerable leadership from government • Set out principles for effective biodiversity offsetting
	Decembe	<p>Defra post discussion materials about biodiversity offsetting on website (Defra, 2010b)</p> <ul style="list-style-type: none"> • Intended to feed into the 2011 Natural Environment White Paper • Suggested using Section 106 payments for offsetting

			<ul style="list-style-type: none"> • Summary of responses, published in July 2011 (Defra, 2011a) showed respondents were broadly positive • Concerns about the potential for offsetting to undermine the mitigation hierarchy, increased burden including expertise requirements in local authorities, and implications of maintaining offsets “in perpetuity”
2011	January	Biodiversity Offsetting POSTnote published (POST, 2011)	<ul style="list-style-type: none"> • Provided a summary of biodiversity offsetting for members of Parliament
	May	Defra publish 2011-2015 business plan (Defra, 2011b)	<ul style="list-style-type: none"> • Had “Assess the scope for actions to offset the impact of development on biodiversity” as an action point
	June	UK National Ecosystem Assessment published (UK National Ecosystem Assessment, 2011)	<ul style="list-style-type: none"> • Identified land use change as a major factor in these declines and suggested offsetting as one part of the solution (UK National Ecosystem Assessment, 2011) • Provided much of the evidence for the government white paper (Watson, 2012) however, this was due to contact between departments, not the original intention (Waylen and Young, 2014)
		UK Government White Paper “The Natural Choice: securing the value of nature” (Defra, 2011c)	<ul style="list-style-type: none"> • Promoted the importance of markets for ecosystem services (p. 4) • Set a no net loss objective with plan to move to net gain. • Emphasised the role of planning in securing a sustainable future, but lamented the costly and bureaucratic nature of existing systems (para. 2.33-2.34) • Discussed the upcoming NPPF as a solution to planning issues, including a “new presumption in favour of sustainable development” (para. 2.37) • Introduced biodiversity offsetting as a means of allowing development to achieve no net loss, based on the principles set out in the Lawton Review (para. 2.38-2.40) • Introduced the plan for a two year offsetting pilot testing a new voluntary approach in certain local authorities, running from Spring 2012 (para. 2.41) • Committed to setting up a business-led Ecosystem Markets Task Force to report “to review the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and

			protect nature's services" (Annex I: para. 44) reporting back in 2013
2012	Jan-June	BBOP Standard, Guidelines, and more Resource Papers published (BBOP, 2009b, 2012b, 2012a, 2012c)	<ul style="list-style-type: none"> • The result of BBOP's Phase II work. • Included a published standard for biodiversity offsets and new guidance for measuring losses and gains
	March	National Planning Policy Framework (NPPF) published (Department for Communities and Local Government, 2012)	<ul style="list-style-type: none"> • Substantially simplified the planning process, replacing 44 pieces of previous planning legislation. • First use of "net gain" with respect to biodiversity in English planning policy, stating that "[t]he planning system should contribute to and enhance the natural and local environment by ... minimising impacts on biodiversity and providing net gains in biodiversity where possible" (Department for Communities and Local Government, 2012, para. 109) • Provided a legislative justification for local councils to aim for net gain
	April	Two-year offsetting pilots begin (Defra and Natural England, 2012)	<ul style="list-style-type: none"> • Aimed to assess whether biodiversity offsets helped to streamline planning process and deliver greater benefits for biodiversity (Baker <i>et al.</i>, 2014) • Guidance for using the habitat metric put forward in Treweek, Butcher and Temple (2010) (p. 5-7), did not include a minimum compensation, <i>although the pilots were expressly designed not to test the metric</i> • First English guidance for offset requirements (broadly like-for-like or better; p. 8) • Emphasised importance of the mitigation hierarchy (p. 4) • Allowed organisations to provide their own offsets or purchase them from a provider
	Onwards	Mixed response to offsets in media	<ul style="list-style-type: none"> • Some consider offsetting as a "licence to destroy" (e.g. Monbiot, 2012)
	July	UK BAP succeeded by UK Post-2010 Biodiversity Framework (JNCC and Defra, 2012)	<ul style="list-style-type: none"> • Introduces targets that "[b]y 2020, at the latest, biodiversity values have been integrated into national and local development" and "positive incentives for the conservation and sustainable use of biodiversity are developed and applied" (p. 11)
2013	Unknown	The Thameslink Programme voluntarily set target to achieve BNG for the second	<ul style="list-style-type: none"> • Very early adopter of BNG

	phase of the Thameslink upgrade (Defra, 2013a)	
February	POSTnote on potential solutions for biodiversity and planning decisions published (POST, 2013)	<ul style="list-style-type: none"> Summarises potential policies that might improve the planning system to address biodiversity loss Discusses biodiversity offsetting for compensation
March	Final Report of the Ecosystem Markets Task Force published (Ecosystem Markets Task Force, 2013)	<ul style="list-style-type: none"> Includes mandating biodiversity offsetting as the number one priority recommendation for the government. Sees biodiversity offsetting as a way to save developers time and money, revolutionise conservation in England, and stimulate the competitive growth of businesses.
May	Defra summit on biodiversity offsetting (British Ecological Society, 2013)	<ul style="list-style-type: none"> Called by Owen Paterson, the Secretary of State for the Environment, Food and Rural Affairs Patterson discussed his trips to understand the Australian systems and reported general cabinet support for biodiversity offsetting.
September	Government respond to Ecosystem Markets Task Force report (Defra, 2013b)	<ul style="list-style-type: none"> Announce green paper consultation on biodiversity offsetting. Emphasise that “an offsetting system must deliver benefits for development” (p. 7) and suggest a permissive approach “giving developers the choice to use biodiversity offsetting where it would enable them to meet existing requirements more efficiently than happens currently” (p. 7) Stated that “Following the Green Paper consultation the Government will develop its detailed proposals for using biodiversity offsetting and plans to set these out by the end of 2013” (p.7)
	Meeting of experts promoting species considerations for biodiversity offsets in England (Howard and Gent, 2013)	<ul style="list-style-type: none"> Highlighted "need to designate a set of approaches to offsetting for impacts on each species requiring special consideration in biodiversity offsets" (p.1) Came up with recommendations as to how species should be considered going forwards, including coming up with a list of priority species and further evidence collection as to habitat suitability
Autumn	National Grid state voluntary aim to create biodiversity gain (National Grid, 2013)	<ul style="list-style-type: none"> “National Grid aims to create biodiversity gains by using its land to create a natural grid of better and bigger habitats.” (p.6)

	<p>Defra Green Paper consultation on introducing biodiversity offsetting in England (Defra, 2013a)</p>	<ul style="list-style-type: none"> Presented offsetting as a means to tackle the “twin challenges of growing its economy and improving its natural environment” (both p. 1) as well as reducing uncertainty and cost in development and planning Stated the Government would only bring in an offsetting system if it would make the planning system related to biodiversity “quicker, cheaper and more certain for developers”; “[a]chieve net gain for biodiversity” by ensuring no net reduction in number of units “and seeking to locate offsets in a way that enhances ecological networks (achieving “net gain”); and “[a]void additional costs to businesses” (all p. 8) Results published in February 2016 (Defra, 2016) found a slim majority (53%) of respondents wanted offsetting The majority of respondents from the public opposed offsetting, either in principle or due to a lack of confidence in the proposed system
	<p>Consultation triggers new wave of negative press (e.g. Carrington, 2013; Howarth, 2013)</p>	<ul style="list-style-type: none"> Continue to present offsetting as 'a licence to trash nature'
	<p>Environmental Audit Committee biodiversity offsetting enquiry (Environmental Audit Committee, 2013)</p>	<ul style="list-style-type: none"> Launched to look into the Government consultation on biodiversity offsetting in England Reported that offsetting should only be brought in if, after the pilots had been completed and independently assessed, offsetting was found to bring benefits Considered the metric too simplistic and that a “proper metric needs to reflect the full complexity of habitats, including particular species and ‘ecosystem networks’, and recognise the special status of ancient woodlands and sites of special scientific interest” (p. 3) Emphasised the need to follow the mitigation hierarchy and for offsets to be “near enough to the local development that local people can still enjoy [them]” (p. 3) Stated if biodiversity offsetting were to be brought in, it would need to be mandatory
	<p>HS2 publish biodiversity metric and set route-wide NNL target (Department for Transport and High Speed Two (HS2) Limited, 2013)</p>	<ul style="list-style-type: none"> Broadly similar to Defra metric but first included irreplaceable habitats (which were later removed) and had shorter time to target condition (Natural England, 2016)

2014	March	Report to Defra on lessons learnt from biodiversity offsetting markets in other countries (Duke and ten Kate, 2014)	<ul style="list-style-type: none"> Designed to gather evidence from the US and Australia (existing offsetting markets) Found benefits for developers including efficiency, unblocking developments and reduction in liabilities. Found market design greatly impacts cost and availability of units. Found on-site compensation delivers poor conservation outcomes. Found considerable economic benefit from market and speeding up development.
	April	Offsetting pilots end (Baker et al., 2014)	<ul style="list-style-type: none"> Involved stakeholders generally felt that Defra metric v1 was a consistent, transparent and simple method to measure biodiversity changes that accounted for a wider range of impacts than prior practice Some stakeholders had concerns that the metric omitted certain ecological aspects, was more intensive than current practice, and misvalued certain habitat types All but one of the pilots felt that a voluntary system was insufficient to support widespread biodiversity offsetting In some cases, offsetting was presented by developers as a means to compensate for, instead of avoid, damage potentially undermining the mitigation hierarchy Many developers challenged the increased compensation requirement identified by the metric Found that the current system was not meeting no-net-loss as measured by the metric Concluded that offsetting had the potential to provide improved biodiversity outcomes if additional resources were provided to fund ecological expertise in local authorities but that it would result in increased costs to developers and the benefits in terms of streamlining the planning process were, at best, marginal Publication of metric allowed other organisations to take it on and use it
	June	'To No Net Loss of Biodiversity and Beyond' conference co-hosted by Forest Trends, BBOP, ZSL and Defra in London (Forest Trends <i>et al.</i> , 2014)	<ul style="list-style-type: none"> Included 280 individuals from 32 countries Hosted by Forest Trends, the Business and Biodiversity Offsets Programme (BBOP), the UK Department for Environment, Food and Rural Affairs (Defra), and the Zoological Society of London (ZSL) Identified need for clear policy for no net loss or BNG to become a reality as well as needs to build capacity, strengthen protection, ensure

		monitoring and enforcement, and consistently apply mitigation hierarchy.
	2 nd Forum of Natural Commons held in Regent's Park Hub, London (Verpoest, 2014)	<ul style="list-style-type: none"> • Held to protest No Net Loss conference. • Panels on the narrative behind valuing nature and the potential impact of biodiversity offsetting on communities.
July	Owen Paterson, Environmental Secretary and major proponent of offsetting, loses position in cabinet reshuffle (Phipps, 2014)	<ul style="list-style-type: none"> • <i>Potentially related to government decision not to take offsetting forwards</i>

3) 2014-2016: Industry led BNG

The Government do not take offsetting forwards, *anecdotally due to the negative press and reaction to pilot projects combined with the removal of Owen Paterson, a major proponent of offsetting as an approach, from cabinet. Meanwhile, local planning authorities involved in the offsetting pilots continue with offsetting.* Industry takes the tools published for the offsetting pilots to set and demonstrate progress towards voluntary targets of NNL and BNG that go beyond compliance and *help to shift attitudes in industry to move from ecology being an issue of risks to a measurable sustainability opportunity.* This, *combined with individuals within organisations pushing for better biodiversity outcomes*, leads to multiple projects piloting a BNG approach and a multiple industry and governmental organisations committing to BNG. The good practice guidelines are put together *building on the international principles published by BBOP* and published in response to the need to bring some standardisation to practice and to set out good practice. Local government and industry began calling for mandatory BNG to further standardise practice and provide a 'level playing field'.

2014	Unknown	Transport for London publish framework (Butterworth <i>et al.</i> , 2019, p. 30)	<ul style="list-style-type: none"> • Includes aim to "protect, manage and enhance the natural environment within our land holding" (Butterworth <i>et al.</i>, 2019, p. 30)
2015	March	Department for Transport publish Road Investment Strategy: for the 2015/16 – 2019/20 Road Period (Department for Transport, 2015)	<ul style="list-style-type: none"> • Includes aspiration for NNL by 2020 and BNG by 2040
	June	Highways England publish biodiversity plan (Highways England, 2015)	<ul style="list-style-type: none"> • Reiterates plan for roads to achieve BNG by 2040 • Includes commitment to creating or adopting a biodiversity metric by December 2017
	October	Barratt Homes include habitat enhancement in operational principles (Barratt Developments plc, 2015)	<ul style="list-style-type: none"> • State that they 'seek to enhance habitats, biodiversity and local environments across all of our developments.' • Early steps towards BNG in housing sector

	(pre-)November	Network Rail Infrastructure pilot Projects make commitment for net positive for biodiversity to be business-as-usual by March 2019 (Darbi, 2015; IEMA, 2015)	<ul style="list-style-type: none"> • A series of webinars discuss Network Rail Infrastructure Projects' commitment to achieving a "measurable net positive contribution towards biodiversity in the UK" (Darbi, 2015) • And "plans for Net Positive to become business-as-usual by March 2019" (IEMA, 2015)
	December	Lichfield District Council introduce BNG aim (Lichfield District Council, 2015)	<ul style="list-style-type: none"> • "Core Policy 13: Our Natural Resources is the over arching policy which... seeks to deliver a net gain for biodiversity where impacts arise from development proposals" (p. 31)
2016	February	Defra publish summary of responses to 2013 Green paper biodiversity offsetting consultation (Defra, 2016)	<ul style="list-style-type: none"> • Next steps section does not discuss taking offsetting forwards, instead stating they will "continue to work ... to further our shared understanding of how best to compensate for biodiversity loss when it cannot first be avoided or mitigated" (p. 37)
	May	Lichfield District Council introduce BNG requirement (Lichfield District Council, 2016a, 2016b)	<ul style="list-style-type: none"> • "Developments which take into account the role and value of biodiversity ... and must deliver a net gain for Biodiversity." (p. 6)
	October	Industry increasingly adopt BNG	<ul style="list-style-type: none"> • WSP publish report on BNG and its role in infrastructure (WSP and Parsons Brinckerhoff, 2016), predicting BNG's inclusion in planning policy and discussing the usefulness of creating a consistent understanding to create a level playing field for developers. • Crossrail 2 introduce BNG aim. • Barratt Homes introduce a net positive biodiversity target (Barratt Developments plc, 2016).
	December	Biodiversity Net Gain: Good Practice Principles for Development published (CIEEM, CIRIA and IEMA, 2016)	<ul style="list-style-type: none"> • Industry led principles for good practice BNG that contributes to strategic priorities and sustainable development adapted from the BBOP principles. • Gave industry criteria show that projects have followed good practice. • Included a clear definition of BNG as "development that leaves biodiversity in a better state than before. It is also an approach where developers work with local governments, wildlife groups, landowners and other stakeholders in order to support their priorities for nature conservation" (p. 2)

4) 2016-2019: Brexit policy shock

The UK votes to leave the EU, meaning the 80% of UK environmental legislation derived from the EU is up for debate (Friends of the Earth, 2021) *creating a window for substantial environmental policy change* and catalysing the passage of the Environment Bill through Parliament. As one of the proposed inclusions in the Environment Bill, the Government consults on making BNG mandatory, leading to the government committing to including it in the Bill. Requirements for environmental

legislation post-Brexit are negotiated between the House of Commons and House of Lords, with some arguing that the outcomes would be weaker than those conferred by EU legislation despite the non-regression clause. Independently of Brexit, the UK government strengthens biodiversity net gain legislation, including the first policy mention of “measurable” BNG. Within industry, by 2018, some 60 companies worldwide were estimated to have public, company-wide commitments or aspirations for No Net Loss of biodiversity or similar (BBOP 2018b).

2016	June	UK referendum results in 3.8% winning margin for leave (Uberoi, 2016)	<ul style="list-style-type: none"> 80% of the UK's laws at the time that came from the EU (Friends of the Earth, 2021), potential for all of these to be changed Societal will for stronger environmental legislation: in a survey, 83% of people surveyed said Britain's new environmental laws after Brexit should be at least as good (37%) or even better (46%) than those from the EU (Carrington, 2016)
2017	March	European Union (Notification of Withdrawal) receives Royal Assent (<i>European Union (Notification of Withdrawal) Act 2017 (c. 9)</i> , 2017)	<ul style="list-style-type: none"> Set the legislative process of Brexit in motion
	May	Berkeley Group commit to achieve biodiversity net gain on new developments (Berkeley Group, 2017)	<ul style="list-style-type: none"> The “first developer [in England] to commit to achieving a net biodiversity gain on every new site” (p.
	July	First reading of the European Union (Withdrawal) Bill (Department for Exiting the European Union, 2018)	<ul style="list-style-type: none"> First public version of the legal requirements for the UK after leaving the EU Little discussion of environmental issues (HM Parliament, 2018)
2018	August	Mayor of London publishes draft London Environmental Strategy (Mayor of London, 2017)	<ul style="list-style-type: none"> Includes policy 5.2.1 to “[p]rotect a core network of nature conservation sites and ensure a net gain in biodiversity”
2018	Unknown	BBOP publish Roadmaps for Government and Business, Resource Papers, and Overview with Call to Action (BBOP, 2018)	<ul style="list-style-type: none"> Marked the conclusion of BBOP's activities. Provided clear and actionable roadmap and guidance for governments and businesses wanting to go forwards with offsetting. Aimed at following the mitigation hierarchy to achieve at least No Net Loss and preferably a Net Gain.

	<p>UK Government publish 25 Year Environmental Plan “A Green Future: Our 25 Year Plan to Improve the Environment” (HM Government, 2018)</p>	<ul style="list-style-type: none"> • Commits to ambitious development targets and to “embed a ‘net environmental gain’ principle for development ... enabl[ing] housing development without increasing overall burdens on developers.” (p. 33) • Stated that the government would work to mainstream existing net gain approaches within the planning system, update the associated tools, and reduce process costs for developers • Discussed strengthening the requirement for planning authorities to ensure environmental net gain, including consulting on making this mandatory
Feb-May	<p>European Union (Withdrawal) Act debated in the House of Lords (Maer, 2018a)</p>	<ul style="list-style-type: none"> • Non-government amendment requiring the protection of EU environmental principles and standards, including equivalent independent oversight, added on the third reading
May-Aug	<p>Defra launch Consultation on Environmental Principles and Governance after EU Exit (Defra, 2018b)</p>	<ul style="list-style-type: none"> • Set out that a statutory policy statement on principles and accountability, including the creation of a new body to hold government to account, would be created through an Environmental Principles and Governance Bill • Appeared to move towards environmental net gain, causing some concerns (e.g. Environmental Audit Committee, 2018a, para. 139) leading the Government to clarify that “biodiversity net gain is, and should remain, the central pillar around which wider approaches might be developed” (Environmental Audit Committee, 2018b, p. 16) and that “developing the concept of environmental net gain will take place over a longer timescale” (Environmental Audit Committee, 2018b, p. 17)
June	<p>European Union (Withdrawal) Act returns to House of Commons (Maer, 2018b)</p>	<ul style="list-style-type: none"> • Lords’ amendment requiring protection of EU environmental standards voted against and replaced with weaker obligation for the Government to publish environmental principles within six months of the bill and to make provisions for the creation of a public body able to take enforcement action against the government
	<p>European Union (Withdrawal) Act receives Royal Assent</p>	<ul style="list-style-type: none"> • New amendments from the House of Commons unchallenged • Set legal requirements to publish environmental principles and make provisions for a new public body for enforcement
July	<p>National Planning Policy Framework revised (Ministry of Housing, Communities and Local Government, 2018)</p>	<ul style="list-style-type: none"> • Strengthens wording around BNG (“should” rather than “where possible”, adds “measurable”): “plans should ... identify and pursue opportunities for securing measurable net gains for biodiversity.” (para. 174)
November	<p>EU-UK withdrawal agreement (with backstop) (House of Commons Library, 2019)</p>	<ul style="list-style-type: none"> • Required non-regression from EU environmental standards after Brexit to avoid a hard border between Northern Ireland and Ireland if the Northern Ireland protocol were triggered

		Natural England post about development and trialling of updated metric (Natural England, 2018)	<ul style="list-style-type: none"> • Promised improved treatment of ecological connectivity, greater habitat type coverage, and a new spreadsheet-based tool for application
	December	Government Publish draft version of Environment (Principles and Governance) Bill (Defra, 2018a)	<ul style="list-style-type: none"> • Met legal requirements set by the European Union (Withdrawal) Act (2018) to publish environmental principles and make provisions for a new public body, the Office for Environmental Protection (OEP) • Did not adequately set out the independent body's scope for enforcement to meet non-regression requirements of withdrawal agreement, said this would be considered ahead of the final bill being published (Defra, 2019a) • Failure to achieve non-regression, particularly the lack of independence of the OEP, was criticised by multiple bodies (Environmental Audit Committee, 2019, para. 55; Environment, Food and Rural Affairs Committee, 2019, p. 3) and external stakeholders (inc. Business Green, ClientEarthUK, IEEMA, Greener UK and the WWF; Smith and Priestley, 2019) • Concern that other parts of the bill, including BNG, had not been submitted for scrutiny (Environmental Audit Committee, 2019)
2018-2019	Throughout	Multiple organisations adopt biodiversity net gain and develop biodiversity metrics	<ul style="list-style-type: none"> • 'Network Rail Biodiversity Calculator' (Network Rail, 2018) • Highways England 'biodiversity metric' (Highways England, 2019) • Transport for London 'toolkit' (Jackman, 2019) • Warwickshire County Council 'locally derived Defra metric' (Lowe, 2019) • SSE 'Full BNG Toolkit' (Scottish & Southern Electricity Networks, 2019) • Balfour Beatty's A Better Balance: a roadmap to BNG (Balfour Beatty, 2018)
	Dec-Feb	First Defra consultation on Net Gain (Defra, 2018c)	<ul style="list-style-type: none"> • Introduced the government's proposed approach to BNG • Asked whether net gain should be mandated in the UK for developments in the scope of the Town and Country Planning Act (TCPA) (1990) • Suggests a "a 10% gain in biodiversity units would be a suitable level of net gain to require in order to provide a high degree of certainty that overall gains will be achieved, balanced against the need to ensure any costs to developers are proportionate" and that this "would be a mandatory national requirement, but should not be viewed as a cap on the aspirations of developers" (p.30) • Included an impact assessment (Regulatory Policy Committee, 2018) estimating BNG would have a direct cost to developers and landowners £63.8m per year (2017 prices), with 90% of this falling on landowners due to impact on land prices

2019	February	<p>CIRIA, IEMA and CIEEM publish further BNG guidance for implementation of the good practice principles (Baker, Hoskin and Butterworth, 2019)</p>	<ul style="list-style-type: none"> Includes case studies and expansions on the original 2016 Good Practice Principles
		<p>National Planning Policy Framework updated (Ministry of Housing, Communities and Local Government, 2019)</p>	<ul style="list-style-type: none"> Wording on BNG does not change from 2019 version
March		<p>Government commits to mandating BNG as part of the Environment Bill (Defra Press Office, 2019)</p>	<ul style="list-style-type: none"> Gave confirmation that BNG would be part of the Environment Bill and, if passed, become part of English law
	July	<p>Biodiversity Metric 2.0 is published as a beta test for consultation by Natural England (Crosher <i>et al.</i>, 2019)</p>	<ul style="list-style-type: none"> <i>Intended to provide a standardised metric that could be used in place of the many organisational metrics that were being developed</i> Addition of connectivity and strategic location for the calculation of base pre- and post- intervention units Risk factor made up of difficulty of habitat creation x time to target condition x off-site risk also included for calculating post-intervention units Addition of new 'very high' distinctiveness score for highly threatened and internationally scarce habitats Improved treatment of features such as urban trees and green roofs
		<p>Summary of responses and government response to the first Defra consultation on Net Gain published (Defra, 2019b)</p>	<ul style="list-style-type: none"> Found that 78% of respondents supported mandatory net gain for developments in the scope of the TCPA Some respondents highlighted issues such as planning authority capacity, presence of loopholes including the use of the tariff by developers to avoid responsibility, and focus on interests of developers over those of nature <p>Committed to:</p> <ul style="list-style-type: none"> 10% net gain with no broad exemptions support for LPAs to address capacity issues creation of a publicly available register of gains exclusion of irreplaceable habitats continued evaluation and minimisation on the impact on industry

5) 2019-2021: Tug-of-war via Parliament

During this period, biodiversity net gain is presented to Parliament as part of the Environment Bill. The EU-UK withdrawal agreement is renegotiated, removing the need for environmental non-regression. Parallel with this, biodiversity net gain legislation is debated in parliament, with motions

to strengthen BNG legislation failing, with the government stating they would be infeasible or disproportionate. *The significant debate around the policy is likely compounded by significant lobbying both to strengthen the policy and, on the other hand, to ensure it does not significantly impact development.* Eventually, the Environment Act gains Royal Assent, creating a legal requirement to legislate for BNG. *Also within this period, corporate interest in biodiversity increases, including the rise of discussion around 'Nature Positive'.*

2019	October	<p>Final Defra impact assessment of BNG issued (Regulatory Policy Committee, 2019a)</p>	<ul style="list-style-type: none"> • Suggested considerably higher costs to developers £199.0m per year, but again with 90% of this falling on landowners through changes to land prices • Included ongoing costs to local government of £9.5m per year, which were not included in the previous impact assessment • Regulatory Policy Committee deemed impact assessment fit for purpose (Regulatory Policy Committee, 2019b)
		<p>Environment Bill 2019-19 (House of Commons, 2019) passes first and second readings in the House of Commons (Smith and Priestley, 2020)</p>	<ul style="list-style-type: none"> • Included the environmental principles and requirement for environmental improvement plans (chapter 1) and provisions for the OEP (chapter 2) that had been present and scrutinised in the draft bill (Defra, 2018a) • Strengthened NERC (2006) general “duty to conserve biodiversity” to duty to “conserve and enhance biodiversity” • Required that the “biodiversity value attributable to the development exceeds the pre-development biodiversity value of the onsite habitat” (p. 206) by at least 10%. • Covered developments under the TCPA (1990), excluding those permitted through development orders and urgent Crown development, making the submission and approval of a BNG plan a planning requirement • Provisions for the creation of “the biodiversity gains site register”, purchase of credits from the Secretary of State, requirement to publish a national habitat map for England, and conservation covenants • Included several clauses enabling the Secretary of State to propose secondary legislation to change BNG requirements after the bill becomes an Act of Parliament (known as Henry VIII clauses) • Concern about lack of ambition, multiple ministers called for the bill to be strengthened to avoid regression from the UK’s high environmental standards under the EU
		<p>UK Parliament net gain POST brief published (Wentworth, 2019)</p>	<ul style="list-style-type: none"> • Gives background on net gain for use by members of Parliament

		New EU-UK withdrawal agreement (Curtis et al., 2019)	<ul style="list-style-type: none"> Removed need for environmental non-regression post-transition period
	November	Environment Bill 2019-19 falls at dissolution of Parliament (Smith and Priestley, 2020)	<ul style="list-style-type: none"> Paused legislative process for BNG until it is next proposed
	December	Intertidal habitats added to biodiversity metric calculator (Natural England, 2019)	<ul style="list-style-type: none"> Allowed BNG to be applied to intertidal habitats in a more standardised manner
		Environment Bill 2019-20 announced in Queen's speech (Prime Minister's Office and Her Majesty The Queen, 2019)	<ul style="list-style-type: none"> Restarted legislative process for BNG
2020	January-February	Environment Bill 2019-20 passes first and second readings in House of Commons (Smith and Priestley, 2020)	<ul style="list-style-type: none"> Broadly the same as Environment Bill 2019-19 Clarified that where sites already on the biodiversity gains site register are developed again, any further gain must be measured from the final intended metric value, irrespective of whether it had already been delivered Concerns remained over non-regression from EU standards and the level of power afforded to the OEP
	February	The Biodiversity Metric 2.0 consultation closes (Natural England, 2020)	<ul style="list-style-type: none"> Summary and government response published in August Allowed practical experience to be incorporated into the metric
	March-May	House of Commons Committee stage of Environment Bill 2019-20 (Smith, 2021a) followed by Report Stage and Third Reading (Smith, 2021b)	<ul style="list-style-type: none"> Multiple Opposition amendments put forward to strengthen the protections afforded by the Bill Called to: make 10% a minimum that could only be revised upwards; secure gains in perpetuity; remove powers for Secretary of State to add to the list of exempted development; and strengthen OEP and its independence. All either failed on division or were withdrawn, with the Government arguing they were infeasible and disproportionate <i>Ideas such as increasing the duration of protection for gains were also unpopular with many potential habitat providers</i> Multiple Government amendments added limiting when the OEP can initiate an environmental review and initiate or intervene in judicial review proceedings
2021			

July	Dasgupta review (Dasgupta, 2021)	<ul style="list-style-type: none"> Presented research on treating nature as an economic asset, how to value biodiversity and how to treat nature as a portfolio with risk and uncertainty. Showed that acting for biodiversity now was more beneficial for the economy than delaying action and that the UK needed to do more to achieve a nature positive future, which would require conserving and improving nature, changing economic measures of success, and transforming institutions and systems.
	Defra Biodiversity Metric 3.0 and supporting information published (Panks <i>et al.</i>, 2021)	<ul style="list-style-type: none"> Removed connectivity from the metric Was published with a small-sites metric, designed to make biodiversity assessments for small developments more proportionate Included multiple other small improvements <i>Created lots of interest from habitat providers</i>
August	BS 8683 - Process for designing and implementing Biodiversity Net Gain published (BSI, 2021)	<ul style="list-style-type: none"> Provided a framework to demonstrate that a project has followed a process based on UK-wide good practice. Aimed to help to avoid 'greenwashing' claims around projects doing BNG
June	Government response to Dasgupta Review (HM Treasury, 2021)	<ul style="list-style-type: none"> Government commits to 'nature-positive' future in response to Dasgupta review Announce intention to amend Environment Bill to include Nationally Significant Infrastructure Projects (NSIPs) within BNG <i>following a positive response to this within consultations</i>
June-September	Environment Bill 2019-20 debated in House of Lords (Smith, 2021b)	<ul style="list-style-type: none"> Government amendment (no. 55) includes NSIPs within BNG, significant as it requires BNG outside of the planning system Further Government amendment (no. 57) to mean minimum duration of gains may only be increased from the 30 years initially tabled and for the potential for such an increase to be regularly reviewed (no. 58)
Oct-Nov	Environment Bill 2019-20 'ping pong' stages between Lords and Commons (Smith, 2021b)	<ul style="list-style-type: none"> Disagreement about level of independence of the OEP Lords eventually stopped insisting the OEP had full independence to carry out its functions as it saw fit, leaving substantial limits on OEP's power
November	Environment Act gains Royal Assent (Environment Act 2021)	<ul style="list-style-type: none"> Set the precedent and requirement for the introduction of BNG into English law, setting out powers to create regulations to legislate for net gain

6) 2022 onwards: Implementation phase

This period represents the lead up to BNG coming into force including considerable consultation on and increased clarity about how BNG will be legislated for; increased funding for LPAs; and the publishing of guidance and the statutory tools. The official mandate is repeatedly delayed, causing anger within some stakeholders.

2022	Jan-April	<p>Defra consultation on Biodiversity Net Gain Regulations and Implementation (Defra, 2022a)</p> <ul style="list-style-type: none"> Consulted on proposed BNG regulations, notably: <ul style="list-style-type: none"> Preference for on-site biodiversity compensation Last resort of purchasing statutory biodiversity credits from the UK Government where developers are demonstrably unable to achieve biodiversity net gain through on- and off-site options Aim of introducing BNG for NSIPs by 2025 Suggested developers could sell excess BNG units Register only for off-site gains The inclusion of green infrastructure within BNG Allowing stacking of biodiversity units with other units e.g. carbon Monitoring responsibility left to landowner/developer Alongside this, the Government announced £4 million in funding for LPAs to prepare for mandatory BNG (Defra <i>et al.</i>, 2022)
	March	<p>Joint open letter to Secretary of State for Levelling Up, Housing and Communities, Secretary of State for Environment, Food and Rural Affairs, and Chairman of Natural England (zu Ermgassen <i>et al.</i>, 2022)</p> <ul style="list-style-type: none"> Called for care to be taken that BNG fulfil its potential for nature recovery Pointed out potential for BNG to allow loss of English nature if units promised fail to materialise Highlighted three key issues for BNG to produce genuine gains: <ul style="list-style-type: none"> Need for credible mechanisms for monitoring and enforcement of gains Under-resourcing and skills deficit within local authorities, leading to limited oversight of BNG projects; and Dominance of on-site gains as opposed to more ambitious and coordinated nature recovery efforts
	April	<p>Defra Biodiversity Metric 3.1 and supporting information released (Panks <i>et al.</i>, 2022)</p> <ul style="list-style-type: none"> Relatively small changes from 3.0, mainly focussing on clarifying guidance and revising condition assessments (Natural England, 2022)
	June	<p>Defra consultation on marine net gain (Defra, 2022b)</p> <ul style="list-style-type: none"> Proposed looking at both habitats and species Incorporation of environmental benefits conferred by biodiversity, while remaining 'nature first' Potential for a contributions-based rather than metric-based approach Considered pressure-reduction, as well as restoration. Will be mandatory <p>OEP mission statement published (Office for Environmental Protection, 2022)</p> <ul style="list-style-type: none"> "[T]o protect and improve the environment by holding the government and other public authorities to account" (p. 5) Confirmed the OEP would oversee LPAs, not be oversight for individual net gain projects

		ALGE publish results of survey looking at local authority capacity to carry out BNG (Snell and Oxford, 2022)	<ul style="list-style-type: none"> Found that LPAs are lacking the ecological capacity required for BNG Only 5% of respondents felt they currently had adequate ecological resource to scrutinise all applications that might affect biodiversity Fewer than 10% reported their current expertise and resources will be adequate to deliver BNG Nearly half stated they do not regularly look at any advice or guidance
	July	Government response to joint open letter (Benyon, 2022)	<ul style="list-style-type: none"> Stated that work is being done on how to better enforce BNG and that the “Levelling Up and Regeneration Bill” will help to strengthen enforcement powers Stated further funding for LPAs would be announced and changes to planning fees would also help with resourcing Investigating inclusion of on-site gains in register Future review of monitoring duration Creating guidance about thresholds to be able to move to the next stage of the mitigation hierarchy
	Aug-Sept	Technical consultation on the biodiversity metric (Defra, 2022c)	<ul style="list-style-type: none"> Sought opinions on the metric prior to publishing the version that would likely become statutory
2023	Jan	Environmental Improvement Plan (update to 25 YEP required by Environment Act) (HM Government, 2023a)	<ul style="list-style-type: none"> Information on markets – publish policy framework in spring 2023 as part of updated Green Finance Strategy 10% mandate to be introduced from November 2023 Confirmed further funding would be available for LPAs Mentioned exploring marine net gain Cost recovery for environmental regulators
	Feb	Stacking guidance published (Defra and Natural England, 2023)	<ul style="list-style-type: none"> Confirmed stacking would be allowed with nutrients units For voluntary schemes, e.g. carbon credits, only biodiversity units above what would have been created by standard practice for the voluntary credits can be claimed, e.g. further habitat enhancements that do not impact the carbon value
		Nationally Significant Infrastructure: action plan for reforms to the planning process published (Department for Levelling Up, Housing & Communities, 2023)	<ul style="list-style-type: none"> Sets November 2025 as the date from which BNG will be mandated for NSIPs Confirms they will be subjected to the same 10% gain maintained for 30 years as other developments Also confirms that marine net gain will be mandated, but does not give a date

	Government response to Defra consultation on BNG regulations and implementation (Defra, 2023c)	<ul style="list-style-type: none"> Conformation of an extra £16.71 million of funding for LPAs to prepare for mandatory BNG Defined the scope of BNG (i.e. what will be exempted) Stated that secondary legislation on definitions of irreplaceable habitats will be added in future Confirmed sale of 'excess' on-site gains will be allowed No centralised trading platform or recording of credit prices No register for on-site gains LPAs will be enforcing BNG, then they will be held accountable by OEP
March	Defra Biodiversity Metric 4.0 and supporting information published (Natural England, 2023b)	<ul style="list-style-type: none"> Changes made primarily focused on ease of use (Natural England, 2023a) Also changes to spatial risk multiplier Would likely form the basis of the statutory metric after being put before Parliament, expected to be in November 2023 (Burke, 2023) <i>Seeing the likely statutory metric has made many potential habitat providers pull back in response to other uncertainties</i>
	Government response to consultation on the biodiversity metric (Defra, 2023a)	<ul style="list-style-type: none"> Will consider species inclusion for next metric update
	'Mobilising Green Investment' the Government Green Finance Strategy published (HM Government, 2023b)	<ul style="list-style-type: none"> Set target to "mobilise at least £500 million of private finance per year into nature's recovery in England by 2027" (p. 74) citing BNG as a part of achieving this
	Summary of responses to Defra consultation on marine net gain published (Defra, 2023f)	<ul style="list-style-type: none"> Respondents highlighted need for ecosystem approach considering species and off-site impacts. 81% of respondents agreed Marine net gain should be mandatory.
May	Guidance for selling offsite units (Defra, 2023d)	<ul style="list-style-type: none"> Reiterates points made in previous documents
July	UKHab 2.0 released	<ul style="list-style-type: none"> Changes made to add new habitats and increase standardisation of use. Changes to codes mean not all habitats align with the previous UKHab 1.1
Septemb	BBC Report on "delays" to BNG (Marshall and Prior, 2023)	<ul style="list-style-type: none"> <i>Information about delays to BNG policy is leaked to the BBC</i>

	UK Government release updated timeline for BNG (Defra, Department for Levelling Up, Housing and Communities and Harrison, 2023)	<ul style="list-style-type: none"> Published later the same day as BBC report on delays Moves expected date of mandate for most developments to January 2024 Dates for other projects remain as April 2024 for small sites, and 2025 for Nationally Significant Infrastructure Projects. Commitment to publish the required guidance and regulations by the end of November
	Taskforce on Nature-related Financial Disclosures (TNFD) UK regional launch (TNFD, 2024)	<ul style="list-style-type: none"> Aim “to support a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes”
October	Levelling-up and Regeneration Act 2023 gains Royal Assent (<i>Levelling-up and Regeneration Act, 2023</i>)	<ul style="list-style-type: none"> Adds detail to the Town and Country Planning Act around the correct baseline to use in cases where the value of a habitat has been reduced prior to development
November	Original expected date of mandatory BNG	<ul style="list-style-type: none"> Three months before eventual mandate.
	Government publish draft Statutory Metric and guidance (Defra, 2023e)	<ul style="list-style-type: none"> Draft Statutory metric has small updates from Defra metric 4.0 with updated guidance, including a very short list of irreplaceable habitats Introduction of Biodiversity Gain Hierarchy, only requiring the mitigation hierarchy to be followed for habitats classified as ‘high’ distinctiveness or higher, causing considerable controversy (Colley, 2023)
December	“Is England ready for biodiversity net gain?” Webinar (Rojo Martin, 2023)	<ul style="list-style-type: none"> Potential for draft guidance to change after concerns about Biodiversity Gain Hierarchy. Indicates there are likely to be changes to stacking guidance. Confirms early 2023 date for BNG mandate if “it’s not January, it will be 2 February, for instance” – Lucy Cheeseman, DEFRA deputy head of land use and head of net gain.
	Government publish response to Marine Net Gain consultation (Defra, 2023b)	<ul style="list-style-type: none"> Confirms inclusion of both biodiversity and wider environmental benefits and use of both active and pressure reduction interventions. States the Government will continue working on an assessment framework and run proof of concept projects.

2024	January	Rescheduled expected date of BNG mandate (Defra, Department for Levelling Up, Housing and Communities and Harrison, 2023; Vaughan, 2024)	<ul style="list-style-type: none"> Expected date of mandate delayed to February 2024 for major developments and April for small sites
	February	BNG mandated for major developments of February 12th (Fisher, 2024)	<ul style="list-style-type: none"> Date from which 'large' developments within the scope of the Town and Country Planning Act will be required to demonstrate a 10% biodiversity net gain to get planning permission. State that guidance has been updated based on stakeholder comments.
	April	BNG mandated for small sites (Gowers, 2024)	<ul style="list-style-type: none"> Date from which small sites within the scope of the Town and Country Planning Act will be required to demonstrate a 10% biodiversity net gain to begin work.
2025	November	Expected date of BNG mandate for Nationally Significant Infrastructure Projects (Defra, Department for Levelling Up, Housing and Communities and Harrison, 2023)	<ul style="list-style-type: none"> Date from which NSIPs are expected to be subject to mandatory BNG

Conclusions

This timeline represents an important step in documenting the inception and evolution of BNG policy in England. This has two main uses: the first is a source of learning for countries and institutions looking to implement similar policies; and the second is as a starting point and collection of documents for analyses of Biodiversity Net Gain in England. As BNG practice develops and issues inevitably arise, as with all policies, we hope this timeline will be used to understand the root of such issues, thus helping develop solutions. We believe the timeline also has many other potential uses, such as a starting point to better understand how BNG interacts with other English policies and the emerging concept of 'Nature Positive'; in future research on the changing value given to, and language used for biodiversity in English policy; and understanding political undercurrents that have driven the path of events seen in this timeline. It is only with such research we can create an understanding of what policies like BNG are likely to mean for nature in the context of their accelerating adoption globally.

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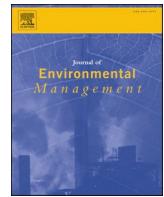
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Research article

Public opinions of a net outcome policy: The case of biodiversity net gain in England

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ABSTRACT

Increasingly, there is social pressure for organisations and governments to recognize and address their biodiversity impact or risk reputational (and potentially financial) damage. Biodiversity Net Gain (BNG) is being introduced globally as a means of addressing biodiversity loss and has recently been mandated in England. Understanding public opinions of BNG is crucial for assessing the likelihood of BNG-related project rejection, which has significant implications for operational risk. Using a questionnaire with a nationally representative by age and gender (for England) sample of 500 people, we found that most respondents had limited knowledge of BNG, with 21 % reporting experience with a project aiming to achieve BNG, but generally accepted its core assumptions: that habitat creation, restoration, or enhancement can achieve net biodiversity gains after development losses (58.2 %), and that biodiversity can be measured using a standardised metric (42.8 %). While distrust was high among most actors involved in BNG, particularly developers (48.2 % somewhat or strongly distrust), wildlife charities and ecological consultants were trusted by most respondents (75.6 % and 66.0 % somewhat or strongly trust respectively). Over half (55.6 %) of the respondents felt that a project's environmental impact is acceptable if it achieves BNG. As a result, BNG may act to reassure the majority of the public about a project's biodiversity impacts thereby reducing operational risk. Our findings suggest four strategies to further boost BNG's acceptability: providing understandable information for stakeholders, involving trusted actors like wildlife charities, avoiding the use of pre-existing biodiversity credits; and ensuring developers are seen as responsible for compensatory sites.

1. Introduction

In 2018, biodiversity net gain (BNG) was consulted on as a potential policy in England in the hope that a “transparent and consistent requirement could provide certainty, allowing developers to factor in [biodiversity] obligations up front” (Defra, 2018, p. 10). Having become mandatory in February 2024 (Stuart et al., 2024), BNG requires most terrestrial developments to demonstrate at least a 10 % increase in the value of biodiversity assessed using the statutory metric, hereafter referred to as ‘the metric’, through on- or off-site compensation measures (Natural England, 2022). As a policy, BNG reflects the previous Conservative Government’s desire to increase the use of private investment and market-based instruments in nature conservation and follows on from a failed attempt to introduce Biodiversity Offsetting (BDO) in the 2010s (Stuart et al., 2024), which proved decidedly unpopular and gained the moniker of being a “Licence to Trash”

(Carrington, 2013; Howarth, 2013).

Much of the disdain towards offsetting revolved around its framing of biodiversity as isolated and ‘placeless’ (Apostolopoulou and Adams, 2015), which underpins two of the central assumptions of BNG: that biodiversity can be measured and compared with a standardised numeric metric; and that the production of one ‘bit’ of biodiversity can be used to replace the loss of another to achieve a neutral or positive net outcome. Further adding to this was a sense that actors involved in BDO, namely developers and Local Planning Authorities, were using it to depoliticise and push through development that should not be given planning permission due to significant environmental and social impacts (Apostolopoulou, 2020). If this perception remains true for BNG it is likely to reduce trust in both the developer and Local Planning Authority. As trust is a key element in individuals’ decisions on whether to accept a project (Stuart et al., 2023), it is likely to have substantial implications for the acceptance of BNG as a whole.

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The approach taken to BNG also has the potential to impact individuals' decisions to accept BNG. Where the approach to compensation is seen as lower risk, individuals may feel less vulnerable and thus be more likely to accept the project even with relatively low levels of trust (Stuart et al., 2023). Within other environmental policies and areas, such as tackling climate change, there is a push for the 'polluter pays principle', in which developers are required to pay for the remediation of any environmental impacts they cause (Damiens et al., 2021). However, the ability to simply buy pre-made 'units' of biodiversity is seen by some as a way for organisations to shirk their environmental responsibilities, allowing environmentally harmful business-as-usual to continue (Biodiversity Net Positive, 2023; Dasgupta, 2024). As such, it is important for developers to know whether buying biodiversity units is seen as an acceptable way of achieving BNG, as this is currently a widely used strategy for small developments (Rampling et al., 2024).

It is of note that, when the UK Government Department for Environment and Rural Affairs (Defra) ran a consultation on whether net gain should be mandated in 2018, BNG proved popular, with 78 % of respondents supporting BNG being made a mandatory requirement and broad acceptance across all stakeholder groups that responded, including a majority of those responding as individuals (Defra, 2019). This represented a substantial change from BDO when the equivalent consultation in 2013 found only 53 % supported the introduction of a biodiversity offsetting system in England, with very little support from individual respondents (Defra, 2016). This is despite BNG not addressing the fundamental objections to BDO, sharing the same assumptions, as discussed above, and broadly using the same tools and methods (Stuart et al., 2024). Further, the ten percent 'gain' within the English BNG policy was chosen as "the lowest level of net gain that the department could confidently expect to deliver genuine net gain, or at least no net loss, of biodiversity" (Regulatory Policy Committee, 2018, p. 20). This means that the main difference between the two policies, and thus subsequent differences in opinion, is one of framing, moving from talking about 'offsets' to 'gains'.

The acceptance, or legitimacy, of BNG is important for two reasons. The first is as an end in and of itself: the perceived legitimacy of a policy, particularly by those within its jurisdiction, is a significant dimension by which policy success is judged (Marsh and McConnell, 2010; Wallner, 2008). The second is that the acceptance of BNG has the potential to impact a project or organisation's Social Licence to Operate (SLO), a conceptualisation that links acceptance of projects and organisations with organisations' ability to function (Stuart et al., 2024). Part of the uncertainty faced by developers during the planning process is community acceptance as, without it, the developer faces significant operational risk, without which planning applications may be rejected (Roddis et al., 2018); thereby increasing the potential of protests, which can cause significant costs and delays (Franks et al., 2014). Further, going ahead without SLO can be seen as a violation of the rights of the local people (Syn, 2014) and result in negative justice outcomes (Bidaud et al., 2017). This means it is important for developers to understand the likely acceptance of a project before going ahead.

During the introduction of BNG, policy makers hoped that "reassured by a robust biodiversity net gain policy, local communities could be more confident in accepting development" (Defra, 2018, p. 2). If true, the extent to which the public (and other stakeholders) understand and accept BNG has the potential to significantly impact the reputational and financial risks associated with development, particularly where developers are relying on BNG to achieve acceptance of their development's biodiversity impacts. However, despite the expectation that BNG would reassure stakeholders, cases have been seen where the environmental impacts of projects using BNG as part of their environmental strategy have been rejected by local communities, meaning this role is not guaranteed, with arguments reflecting those levelled against BDO (Apostolopoulou, 2020; Environmental Law Foundation, 2023).

Our knowledge of opinions of BNG comes from consultations and protests, which tend to consist of highly engaged and/or motivated

stakeholders, often with significant knowledge of and experience with BNG. It is thus hard to know whether our existing understanding is representative of the more general public's views on BNG. This reduces our understanding of how likely it is that the BNG aspects of projects will be rejected and thus has significant implications for operational risk. This paper forms part of a wider project on understanding the acceptance of BNG and what this means for the SLO of developments. The wider project has the aim of informing good practice under mandatory BNG that meets the expectations of social stakeholders and allowing developers to understand and manage the impacts of BNG on operational risk. The specific objective of this research was to gain a broad understanding of the public's knowledge of and opinions about BNG as a policy, as opposed to its impact on specific developments. We used a questionnaire, distributed through a research panel to sample the opinions of 500 people, nationally representative by age and gender. These data were used to address the following broad research question: do the English public accept BNG as an approach to the environment? To answer this, we will look at the following sub-research questions:

1. What is the public's knowledge of and experience with BNG?
2. Do the public believe the assumptions behind BNG?
3. To what extent do the public trust the organisations involved in BNG?
4. What is the public's opinion of BNG as an approach? What predicts this?
5. What is the public's desired approach to BNG?

2. Methods

We undertook an online survey of 500 adults living in England between the 18th and 23rd July 2024 inclusive. Participants were recruited through Respondi, a commercial research panel who provide participants a small incentive for completing the survey. The questionnaire survey was designed to take around 10 min to complete and was accessed in a web browser. A pdf version of the questionnaire has been included as [Appendix A](#). Participant requirements were based on the respondent self-reporting that they were over 16 (answering yes to "Are you over 16?") and that they lived in England (answering yes to "do you live in England?"). These questions were the first thing asked to the potential respondents, as part of the consent form, and any potential respondents who answered no to this were screened out.

Interlocking age and gender quotas (detailed in Table B1) were used to ensure a broadly representative sample. Information on age and gender was gathered at the start of the questionnaire at which point any respondents who were part of a full quota were screened out. Gender was assessed by asking potential respondents "Which of the following best describes your gender identity?" with the options "Female", "Male", "Non-binary/third gender", "Prefer not to say". Where potential respondents did not answer "Female" or "Male", only the age quota was applied. We also gathered a self-reported measure of education for use in the analysis; however, this was not used in the quotas and there were no requirements on education for responding.

A total of 937 people were sent the questionnaire, of which 113 did not start; 109 were screened out due to not consenting or not meeting the participant requirements (over 16 years old and living in England); 136 were rejected due to their respective quota being full; 79 were suspended due to over 30 min of inactivity; leaving 500 completed surveys. Details of the sample are available in [Appendix B](#).

The authors recognize that incentivising respondents can increase rates of careless responding, this is thought to be at least in part due to recruiting less interested respondents (Jaeger and Cardello, 2022). The accurate identification of careless responses is challenging, with no single agreed upon metric (e.g., Conrad et al., 2017; Greszki et al., 2015; Jaeger and Cardello, 2022). As this analysis is aiming to assess the opinions of the general population, some extent of disinterest is both expected and important. This, combined with previous findings that

low-quality “speeder” responses (those where the survey has been completed faster than expected) added random noise to data but made little difference to the results drawn (Greszki et al., 2015), led us to choose not to remove these responses.

To account for the impact “speeder” responses may have had on our results, we tested the sensitivity of our results to two minimum time thresholds. The first was a more extreme version of the psychological threshold based on reading speed used by Conrad et al. (2017) amongst others, removing respondents who answered in less than 2.67 min (“extreme speeders”: 18 respondents), the estimated time taken to read only the questions assuming the disputed “skimming” speed of 450 words per minute (wpm) (Carver, 1992 *per* Brysbaert, 2019). The second threshold removed respondents who answered at least 30 % faster than the median completion time of 7.45 min (“up to 70 % median speeders”: 111 respondents), used as an “inclusive” threshold for speeding by Greszki et al. (2015). The treatment used for “speeder” responses did not impact direction or significance for most analyses; where there was a difference, this is discussed in the text.

After agreeing consent and giving basic demographic information (age, gender identity, education), the questionnaire was split into five sections relevant to this paper: an introduction to BNG; knowledge and opinions of the metric; preferences for compensatory habitat; extent of trust in actors involved in BNG; and overall opinions of BNG as an approach. A short introductory text was given at the beginning of each section introducing a new concept (i.e., all but demographic information and overall opinions) to ensure the respondents had enough knowledge to answer the questions. This work was approved by the University of East Anglia Faculty of Science Research Ethics Subcommittee (Application ID ETH2324-2530). All data were analysed and visualised using

the programming language R. The study utilized R packages including MASS, Tidyverse, ggpqr, etc, and the authors provided the code used for analysis in [Appendix C](#). Where correlations are reported, Pearson correlation coefficients are used and their strengths are given using the conventions set out in [Dancey and Reidy \(2007\)](#) i.e., no correlation if $|r| < 0.1$; weak correlation if $0.1 \leq |r| \leq 0.35$; moderate correlation if $0.35 < |r| \leq 0.65$; strong correlation if $0.65 < |r| < 1$; or perfect correlation, if $|r| = 1$.

3. Results and discussion

3.1. What is the public’s knowledge and experience of biodiversity net gain?

When asked whether they had experience of projects aiming to achieve BNG, 21 % (105 of 500) responded that they had experience with BNG. Of these 105, 48.6 % said they had experience of a local project aiming to achieve BNG, 26.7 % said they had experience of a non-local project, 25.7 % said they had experience of BNG at work (industry), 25.7 % said they had academic experience of BNG, and 5.7 % said they had some other experience. Both knowledge of BNG as a whole ([Fig. 1a](#)) and knowledge of the metric ([Fig. 1b](#)) were significantly associated with whether the respondent reported having experience with a project aiming to achieve BNG, with respondents who reported having experience of BNG tending to report greater existing knowledge of both. Knowledge of BNG and knowledge of the metric were also significantly associated ($\chi^2 = 231$, $df = 12$, p -value <0.0001) meaning that respondent who knew more about one than average, also knew more about the other than average.

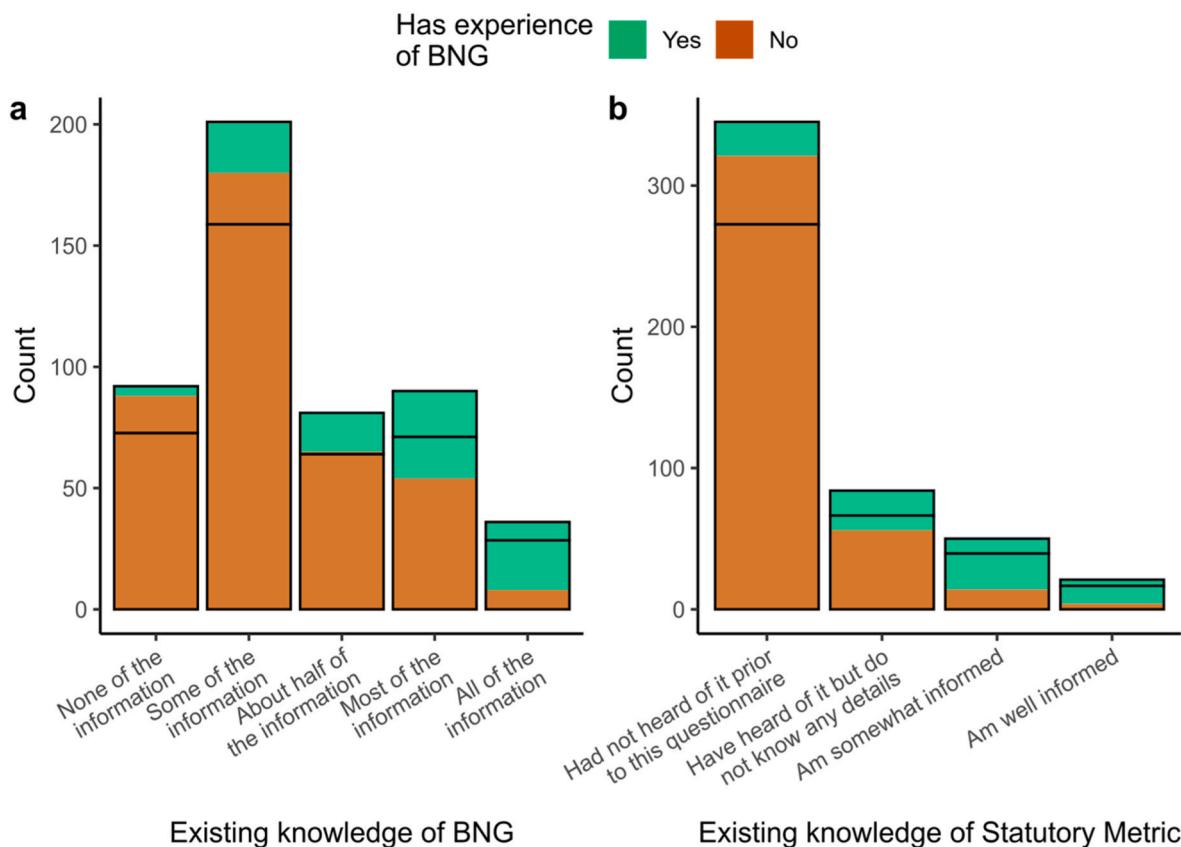


Fig. 1. Respondents who reported having experience of a project aiming to achieve Biodiversity Net Gain (BNG) was associated with higher reported existing knowledge of both: (a) BNG as a whole, measured as the proportion of a short paragraph on BNG respondents reported that they already knew ($\chi^2 = 118$, $df = 4$, adjusted p -value <0.0001), and (b) the metric, measured by asking how much the respondent knew about the metric ($\chi^2 = 173$, $df = 3$, adjusted p -value <0.0001). Both plots are coloured according to whether the respondent reported having experience with a project aiming to achieve BNG. The expected distribution if experience were distributed evenly across levels of knowledge is shown with black lines.

The information given on BNG that formed the basis of our measure of existing knowledge was very basic, with some of it just introducing biodiversity as a concept, meaning that these results suggest the public have a very low level of existing knowledge of BNG. It is surprising, then, that multiple respondents claimed to be 'somewhat informed' or 'well informed' about the metric, a complex and specialist topic, without having known all of the basic and more general information on biodiversity net gain, suggesting some respondents may have misinterpreted the question or over-stated their own knowledge, a known phenomenon within measures of self-reported expertise (e.g., Snibsøer et al., 2018). The number of respondents reporting experience of BNG was also surprisingly high given its recent mandate. This could be for one of three reasons: the proportion of the English public with experience of BNG is higher than expected; respondents said they had experience of BNG thinking it may be required for them to continue the questionnaire (Krosnick, 1991); or, there are respondents who falsely believe they have experience of projects aiming to achieve BNG, meaning their opinions may be based on experiences that do not actually represent BNG itself. More research is required to understand which of these (or combination of these) is true and, if it is the third option, how this might impact acceptance of BNG.

3.2. Do the public believe the assumptions behind biodiversity net gain?

The questionnaire asked about two beliefs related to BNG (Fig. 2): whether respondents believed it was possible to create a net gain in biodiversity by creating, restoring and enhancing habitat after a development causes biodiversity loss (BNG belief) and whether respondents believed it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric (measurement belief). Most respondents believed it was possible to create a net gain after a loss due to biodiversity (58.2 % yes, 30.8 % don't know, 9.8 % no). Less than half of respondents believed it was possible to measure biodiversity with a standardised numeric metric, with many responding that they did not know (42.8 % yes, 41.2 % don't know, 14.8 % no). Five respondents responded "Other" for the BNG belief and six responded "Other" for the measurement belief. Across both questions "Other" answers either gave

more nuanced understanding or expressed uncertainty; due to the very small number we removed the "Other" responses from the subsequent analysis. The two beliefs were significantly associated with one-another, with respondents tending to give the same answer for both questions (Fig. 2).

Due to the high proportion of "Don't know" responses to the measurement belief (believing it is possible to measure and compare biodiversity value with a standardised numeric), we hypothesised that respondents' answers may have been influenced by a lack of information on the topic. People who do not have an internal model for *how* something, such as the 'netting' of biodiversity, may be done are unlikely to believe it is possible (Suchman, 1995). To assess this, we modelled respondents' answers to the metric belief question (whether it is possible to measure and compare biodiversity using a standardised numeric metric) predicted by their existing knowledge of the metric; whether the respondent had chosen to see the additional metric information (optional) before answering the metric belief question; and their BNG belief.

We ran two nested models, the first assessed, across all respondents, what affected whether a respondent answered "Don't know" to the metric belief question. The second assessed, for respondents that answered "Yes" or "No", what factors affected their metric belief. The results of both models supported our hypothesis. Respondents that did not choose to see the metric information were five times more likely to answer "Don't know" to the measurement belief question. Within the respondents that answered either "Yes" or "No" to the measurement belief question, those that had chosen to see the metric text were 2.6 times more likely to answer "Yes". Fig. 3 shows respondents' measurement beliefs, split by: whether they chose to see the metric text, their existing metric knowledge, and BNG belief. This result was significant within the full sample and with "extreme speeders" removed, and near-significant ($p = 0.07$) after removing "up to 70 % median speeders". Full summaries of the analysis for the whole sample are presented in Appendix D2.

Where stakeholders are undecided or weakly against BNG as an approach, providing simple, logical, and easy to understand information about BNG and how it fits in with society may increase acceptance of these beliefs (Leeuwerik et al., 2021; Saenz, 2019; Suchman, 1995). However, this will only increase acceptance where the additional information provided fits with the stakeholders' existing belief systems and their experience of reality (Powell and DiMaggio, 1991 per Suchman, 1995). For example, informed, political arguments are often made against BNG, the metric, and the framing of biodiversity as "placeless" (see e.g., Apostolopoulou and Adams, 2015 as an example) which are highly unlikely to be resolved through providing more information. It is also important to note that we asked respondents whether it is *possible* to create a net gain after a loss of biodiversity and measure biodiversity with a standardised numeric metric, not whether it is possible *in all cases*. It is likely that there are certain places or habitats individuals particularly value and do not see as "offsettable"; more research is required to understand the extent to which this is predictable and how large an impact it has on acceptance.

3.3. To what extent do the public trust the organisations involved in biodiversity net gain?

Fig. 4a shows the level of trust assigned to the main actors in BNG. There was a lack of trust in most actors regarding their roles in BNG, with more respondents stating they somewhat or strongly distrusted than somewhat or strongly trusted developers (48.2 % distrust, 21.8 % trust), central government (44.2 % distrust, 19.4 % trust), private landowners (42.0 % distrust, 18.6 % trust), government agencies (39.0 % distrust, 24.0 % trust), and local planning authorities (34.0 % distrust, 29.2 % trust). In contrast, most respondents stated they somewhat or strongly trusted wildlife charities (4.8 % distrust, 75.6 % trust) and ecological consultants (6.6 % distrust, 66.0 % trust). There was a

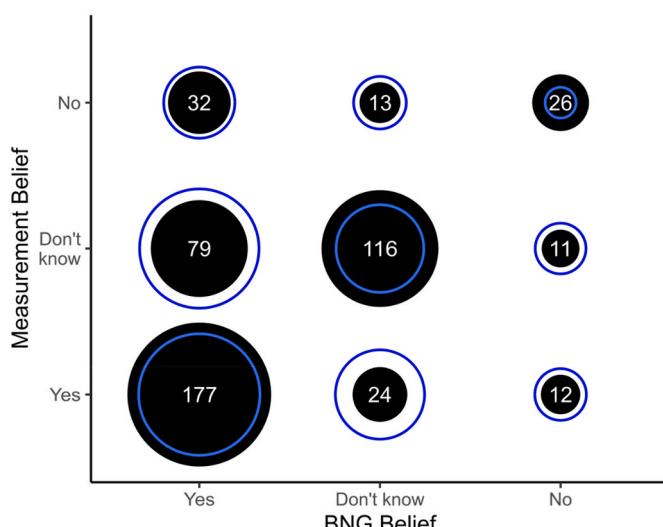


Fig. 2. Respondents' beliefs in whether it is possible to achieve a net gain in biodiversity through habitat creation, restoration, and enhancement after a loss due to development (BNG belief) and whether it is possible to measure biodiversity with a standardised numeric metric (measurement belief) were significantly associated with one-another, with respondents tending to give the same answer for both questions ($\chi^2 = 170$, $df = 4$, p -value <0.0001). Filled black circles and white text labels show the number of respondents who gave each pair of answers, with expected values if the two beliefs were independent shown using a blue ring.

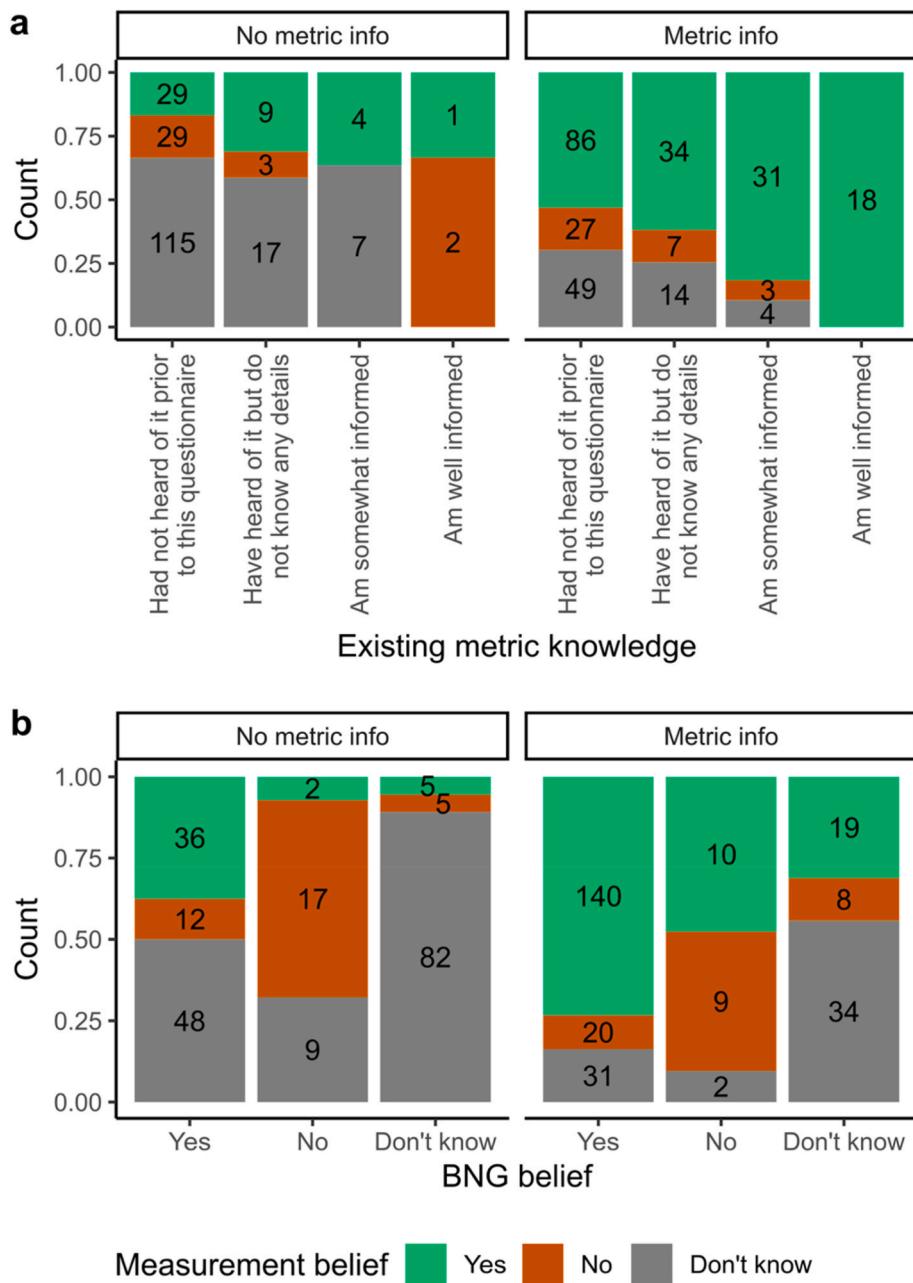


Fig. 3. Differences in proportions of respondents' measurement belief (whether they believed it is possible to measure and compare biodiversity value with a standardised numeric) between respondents who did not (No metric info) and did (Metric info) choose to see additional information on the statutory numeric used to measure biodiversity within Biodiversity Net Gain (BNG), split by (a) existing knowledge of the statutory metric and (b) their BNG belief (whether they believed it is possible to create a net gain in biodiversity through habitat creation or enhancement after a loss due to development).

positive correlation between trust in all pairs of actors, with the exception of wildlife charities and developers, and wildlife charities and private landowners (Fig. 4b, significance and scatter plots shown in Appendix D1; Figure D1.1). For easier analysis, actors were averaged into three groups: external expertise (wildlife charities and ecological consultants); financial beneficiaries (developers and private landowners); and governing bodies (Local Planning Authorities, government agencies, and central Government). There was a strong positive correlation between trust in governing bodies and financial beneficiaries, whereas trust in external expertise was weakly positively correlated with both other actor groups (Appendix D1; Figure D1.2).

The substantial level of distrust in financial beneficiaries is not a new finding, in fact, a survey by the developer Grosvenor found that only 2% of the UK public trusted developers, with most citing that their distrust

was because developers "only care about making money" (Champ, 2019, para. 3). The distrust of governing bodies, again, reflects a wider lack of trust in local and national governing bodies in the UK (ONS, 2022). We hypothesise that this distrust in the context of BNG is a product of two things. Firstly, since its conception as a policy in England one of the primary focuses of BNG has been to benefit, or at least not harm, development (Defra, 2018). Although respondents may not know this about BNG, especially given the relatively low existing knowledge, the approach is consistent with the wider neoliberal stance of the UK government (Knight-Lenihan, 2020). Where regulators are seen as overly pro-development, stakeholders are less likely to be confident that their interests, in this case the protection of the environment, are being adequately prioritised (Lesser et al., 2021; Prno and Slocombe, 2014). Secondly, both within BNG and more widely, there is a lack of capacity

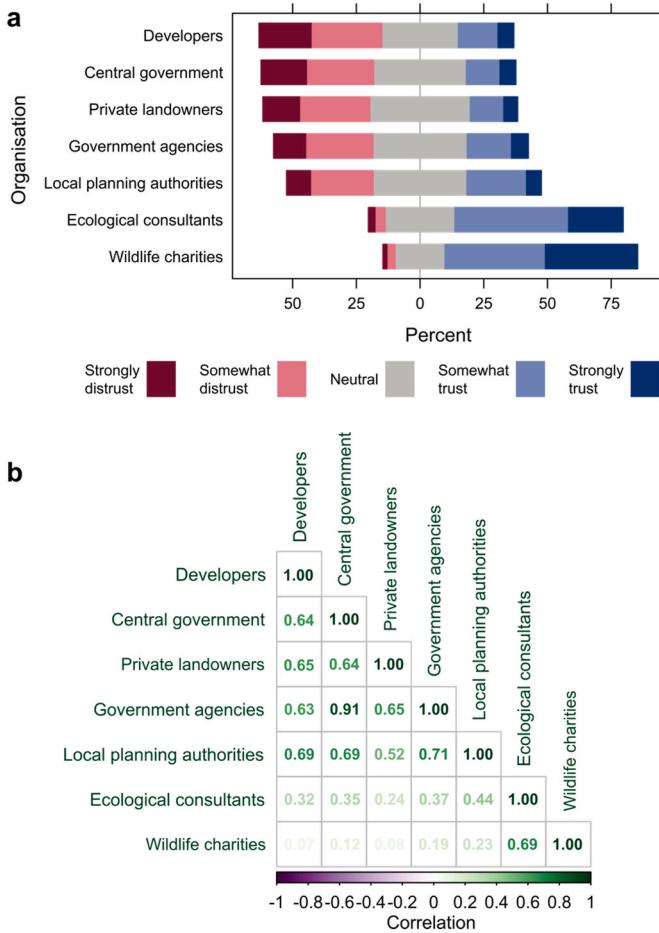


Fig. 4. (a) Respondents' level of trust in organisations involved in Biodiversity Net Gain, ordered from least trusted at the top (developers), to most trusted at the bottom (wildlife charities). Panel (b) polychoric correlation coefficients between trust in all pairs of actors, where present all correlations were positive; stronger correlations are shown in darker green.

within Local Planning Authorities to assess and enforce BNG (Robertson, 2021), meaning that even where governing bodies are seen as having good intentions, they may not be seen as likely to carry through on them (Stuart et al., 2023). Thus, the lack of trust in governance structures is likely to reduce the acceptance of BNG as an approach to the environment in practice.

3.4. What is the public's opinion of biodiversity net gain as an approach?

Most respondents had a positive overall opinion of BNG as an approach (Fig. 5a; 63.8 % somewhat or extremely positive, 6.4 % somewhat or extremely negative); felt the metric was an effective tool for measuring biodiversity (Fig. 5b; 68.5 % somewhat or very effective, 17.3 % somewhat or very ineffective); and agreed that BNG would both improve nature in England (70 % somewhat or strongly agree, 6.4 % somewhat or strongly disagree) and make a project's environmental impacts acceptable (Fig. 5c). This positivity aligns with the support for a BNG mandate seen within the 2018 Defra consultation on BNG (Defra, 2019) and suggests that the positive framing of BNG has been effective at creating more positive perceptions of BNG than were seen for BDO.

It is important to note that, for most respondents, these opinions were based on very limited understanding of BNG and the metric (see section 3.1) and the metric text in the survey providing only basic and un-nuanced information about its components for those who chose to read it. It is increasingly accepted that the valuations and equivalence provided by the metric do not necessarily correlate with the biological

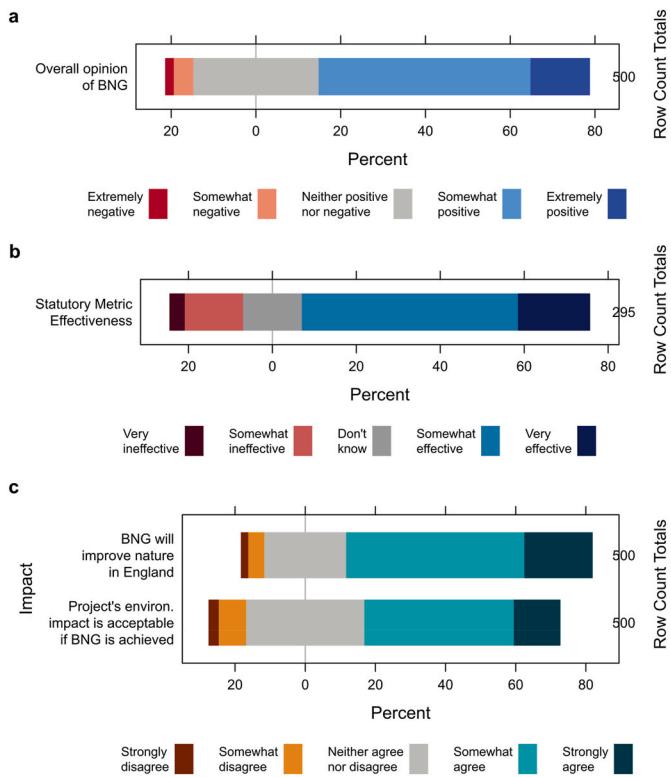


Fig. 5. Respondents' stated opinions of (a) Biodiversity Net Gain as an approach to the environment; (b) the effectiveness of the statutory metric at measuring the value of biodiversity; and (c) the impacts of following Biodiversity Net Gain as a policy.

reality of habitats (e.g., Duffus et al., 2024; Hawkins et al., 2022; Marshall et al., 2024) meaning that, even where compatible within stakeholders' belief systems, with increasing knowledge there is the potential that the results in Fig. 5 will drift towards more negative opinions, leading to potential rejection of BNG for not reflecting stakeholders' experiences of reality. More detailed research is required to understand if, and at what point of knowledge, this occurs.

We modelled respondents' overall opinion of BNG predicted by their BNG belief, measurement belief, whether they had experience with BNG, existing knowledge of BNG, existing knowledge of the metric, trust in external expertise, trust in governing bodies, trust in financial beneficiaries, age, gender identity, and education. The modelling process is described in Appendix D3 and all significant variables are shown in Fig. 6. Across all models, believing it is possible to measure biodiversity with a standardised numeric metric (measurement belief), trust in external expertise, trust in governing bodies, higher educational attainment, existing knowledge of the metric, and believing it is possible to create a net gain in biodiversity after a loss had a significant positive effect on overall opinion of BNG as an approach. Existing metric knowledge had a significant positive quadratic term, meaning the difference between levels of knowledge increased at higher knowledge levels. Education had a significant negative quadratic term, meaning the difference between educational categories decreased at higher education levels. Neither education nor existing knowledge of the metric were significant when the "up to 70 % median speeders" were removed.

The importance of the assumptions underpinning BNG in determining respondents' overall opinions of BNG was not unexpected, as one would expect respondents that do not believe it is possible to create a net gain after a loss due to development, nor that it can be quantified with a standardised numeric metric, to be much less likely to be confident it will have a positive outcome. There were, however, a small minority of respondents who did not believe in the assumptions underpinning BNG

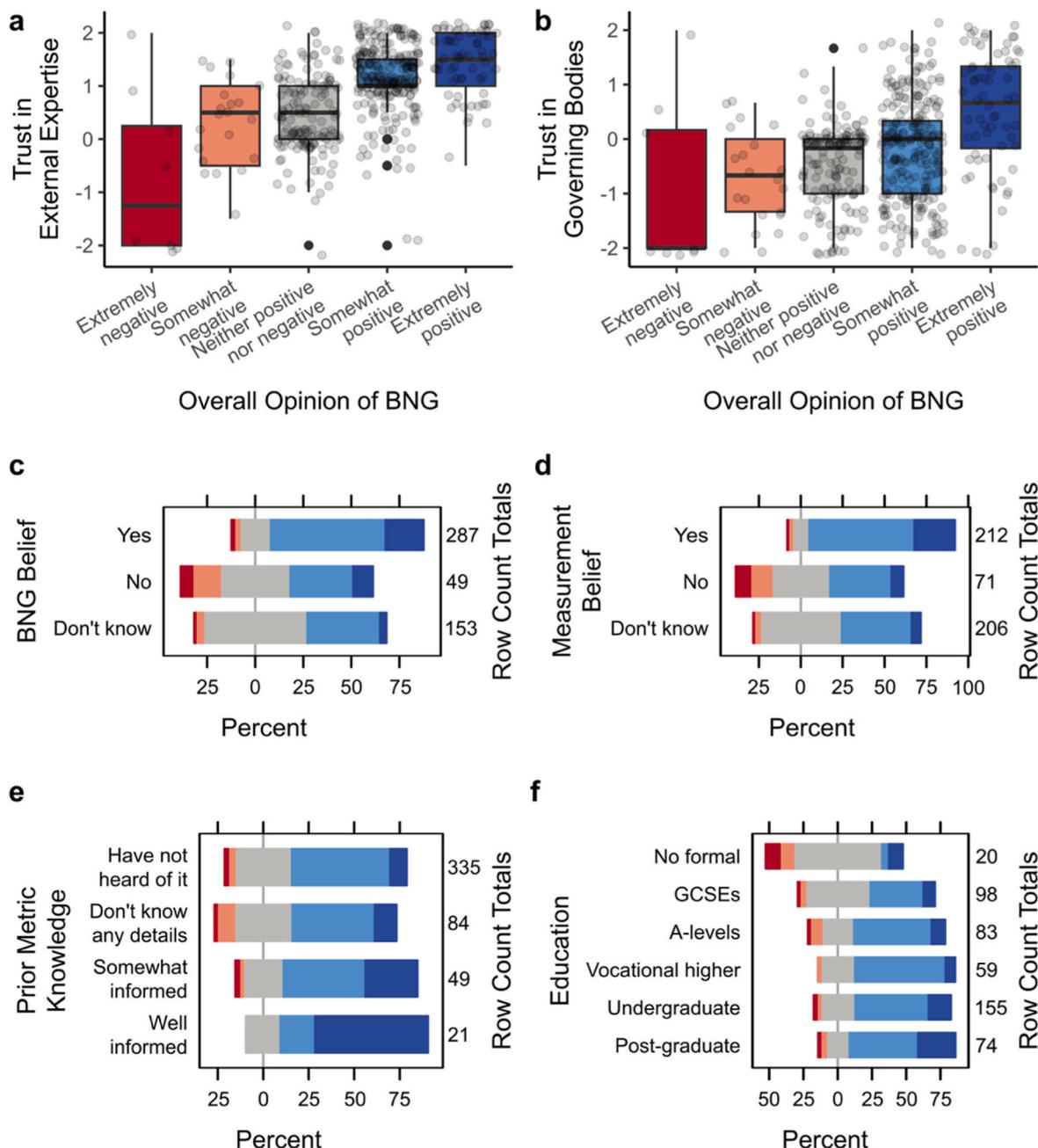


Fig. 6. All factors that significantly predict overall opinion: (a) trust in external expertise; (b) trust in governing bodies; (c) whether the respondent believed it is possible to create a net gain in biodiversity after a loss due to development; (d) whether the respondent believed it is possible to measure biodiversity using a standardised numeric metric; (e) the respondent's existing knowledge of the metric; and (f) the respondent's level of education. Across all panels, overall opinion is shown using colour and position, from very negative in dark red on the left to very positive in dark blue on the right. For panels (a) and (b), numeric values for trust are the mean of Likert-type responses for level of trust in actors within that group ($-2 \approx$ strongly distrust; $-1 \approx$ somewhat distrust; $0 \approx$ neither trust nor distrust; $1 \approx$ somewhat trust; $2 \approx$ strongly trust).

yet had positive opinions of it as an approach to the environment. Although it is only a small sample, this may reflect the cognitive dissonance within neoliberal nature conservation, with the steps needed to 'net' nature seen as both impossible and inevitable (Anantharajah and Evans, 2024), resulting in some stakeholders accepting BNG even where they do not agree with the underlying principles.

Trust and accountability in BNG are particularly important for acceptance as the loss of biodiversity is, in most cases, certain but the gain relies on proper implementation (Rampling et al., 2024). It is, therefore, also not surprising that trust in actors involved in BNG was important in predicting overall opinion. Where stakeholders do not trust

actors to do the right thing, as we have found is the case for financial beneficiaries within BNG, trust in the surrounding governance structures becomes more important as you don't need to trust someone if you trust the person holding them accountable (Stuart et al., 2023). This likely explains the presence of trust in governing bodies as an important factor in determining overall opinion of BNG and the relative unimportance of trust in the financial beneficiaries themselves, although it is of note that trust in financial beneficiaries and trust in governing bodies were highly correlated.

The lack of trust in both developers and private landowners and the governing bodies meant to hold them accountable potentially explains

the importance of trust in external expertise in determining overall opinion of BNG, as external organisations such as NGOs are likely being seen as the last accountability structure protecting the interests of nature. To ensure the effect that trust in external expertise had on overall opinion was not due to it measuring some aspect of intrinsic trust, we re-ran the model including average trust across all actors and residual trust for each actor group; residual trust in external expertise remained significant and thus we determined it was a genuine effect (Appendix D3). More detailed research is required to truly unpick this relationship but it is clear that trust is an important element in the acceptance of BNG. Building trust is difficult and requires repeatedly making and keeping promises, as well as showing that you are acting in the interest of people and nature (Stuart et al., 2023). This takes time and, in the short term, it is likely that developers will need to publicly involve and listen to the trusted actors and sources of independent expertise. However, care must be taken not to delegitimise currently trusted actors by involving them in problematic projects.

3.5. What is the public's desired approach to biodiversity net gain?

Respondents showed a preference for compensation to be provided through a mixture of habitat creation, enhancement and restoration (62.2 %), followed by providing compensation through restoration and enhancement of existing habitats (29.4 %), providing compensation solely by creating new habitats was the least popular option (7.2 %) (Fig. 7a). Six respondents gave "Other" responses to their preferred compensation approach, primarily expressing uncertainty. This may reflect a feeling that we need to look after what we already have, or a distrust in the ecological success of habitat creation, however, more research is required to gain a deeper understanding of desired approaches to compensation and biodiversity losses that may trigger rejection.

Respondents agreed that developers should be responsible for the creation and management of habitat (Fig. 7b: 84 % somewhat or strongly agree, 4 % somewhat or strongly disagree), indicating a desire for BNG to follow the "polluter-restores", as opposed to the "polluter-pays", principle (see e.g., Damiens et al., 2021). Following this, respondents were much less positive about developers being able to buy pre-existing units from others (Fig. 7b: 46.2 % somewhat or strongly agree, 25.6 % somewhat or strongly disagree), reflecting the recent controversy around the use of carbon credits (e.g., Greenfield, 2023). Whether developers should create and manage habitats themselves (Fig. 7b: 58.4 % somewhat or strongly agree, 10.8 % somewhat or

strongly disagree) or be able to pay others to create and manage habitat for them (Fig. 7b: 67.4 % somewhat or strongly agree, 8.2 % somewhat or strongly disagree) was less clearcut, with respondents tending to agree with both statements. There was no significant correlation in respondents' levels of agreement with whether "developers should be responsible for habitat creation and management" and whether "developers should be able to buy pre-existing units", indicating these views are not mutually exclusive. There was, however, a moderate positive correlation between agreement with whether "developers should create and manage habitats themselves" and whether "developers should be responsible for habitat creation" and management, indicating a desire for developers to take responsibility may drive the judgement that developers should create and manage habitats themselves. All correlations between pairs of statements are shown in Appendix D1, Figure D1.3.

3.6. What are the wider implications of acceptance of biodiversity net gain?

When done well BNG, like BDO, can provide a positive contribution to local people's wellbeing, both through ensuring local ecosystem services are retained and enhanced (Jones et al., 2019) and through facilitating development that is wanted by the local and wider community, for example social housebuilding (Places for People, 2024). Carrying out BNG in a way that is socially acceptable, would likely also benefit developers, unless it proves prohibitively expensive to achieve, through reducing operational risk and 'unlocking' development sites that were previously marginal on environmental grounds. It is, however, in this capacity that 'socially acceptable' BNG has the potential to cause social harm. Research on BDO shows that the approaches needed to provide simplicity and certainty for developers, an aim of both BDO and BNG, often directly conflict the more comprehensive and context-dependent approaches that are preferred by many social and environmental stakeholders, representing a value conflict that is not easily solved (Lockhart, 2015; Sullivan and Hannis, 2015).

BNG, like BDO before it, has the potential to provide false objectivity (Carver and Sullivan, 2017) and depoliticise discussions around continuing development and urban expansion (Apostolopoulou et al., 2014). In doing so, it may exclude local communities from both nature and discussions around its fate (Apostolopoulou, 2020; Apostolopoulou et al., 2014; Jones et al., 2019). Such exclusion, where present, is likely to have a disproportionate impact on already marginalised communities, who often lack the power and resources to prevent undesired projects (e.g., Roddis et al., 2018) aggravated by the lack of agreement

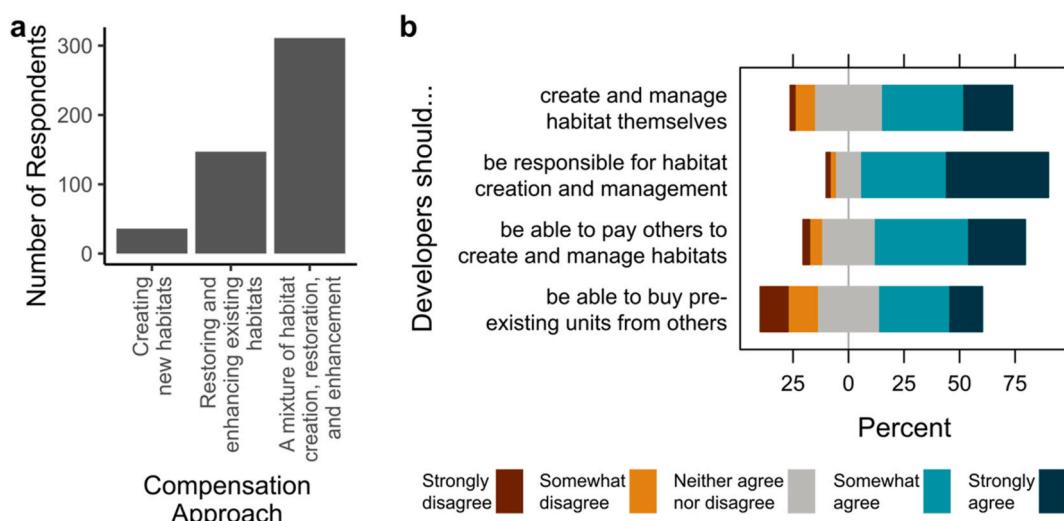


Fig. 7. Respondents' preferences for (a) the approach to compensatory habitat within Biodiversity Net Gain (BNG); and (b) extent of agreement with different approaches for developers to fulfil their responsibilities under BNG.

on the extent of consensus required to deem something as being socially acceptable (see e.g., [Boutilier, 2014](#); [Jijelava and Vanclay, 2014](#); [Wilburn and Wilburn, 2011](#)).

Together, the presence of values conflicts, potential for misuse, and lack of trust in developers and governing bodies mean that, although we have found that BNG is widely accepted as a policy, this does not guarantee its acceptance in practice. In addition, the low levels of trust in developers and governing bodies means that even those who accept BNG as an approach may not believe a developer will carry through on their promises in practice, potentially reducing the impact acceptance of BNG has on overall project acceptance. Real-world project acceptance involves navigating these complex and contextual justice and power dynamics and will be highly dependent on the desirability of the project itself and the specific context within which it is proposed to be built, which extend far beyond this analysis of the general public's opinions 'in theory'.

4. Conclusions

The public's knowledge of Biodiversity Net Gain (BNG) is generally limited, with only 21 % of respondents reporting some form of experience with BNG projects. Even among those who had experience, understanding of key components such as the BNG metric was minimal. Further, due to the tendency for respondents to over-estimate their own knowledge, all measures of knowledge and experience are likely to be an overestimate. This suggests that the public has a low baseline of knowledge about BNG, which could influence their ability to critically evaluate BNG initiatives and policies.

Most respondents (58.2 %) believed the assumption that it is possible to create a net gain in biodiversity by creating, restoring and enhancing habitat after a development causes biodiversity loss. Fewer respondents (42.8 %) believed the assumption that it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric, with a significant number of respondents being unsure (41.2 %). However, respondents who had read extra text describing the metric used to measure biodiversity within BNG were 2.6x more likely to believe that it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric, suggesting the lower acceptance may be due to not having a concept of how the measurement of biodiversity might be made.

Trust in organisations involved in BNG was generally low, particularly for developers and government bodies, with the exception of wildlife charities and ecological consultants, who were viewed as more trustworthy. This trust disparity is critical, as the public's confidence in the entities responsible for implementing and overseeing BNG efforts directly impacts their acceptance of such initiatives.

Overall, the public holds a generally positive view of BNG as an approach, with only 6.4 % of respondents having a negative view of BNG as an approach to the environment and over half responding that a project's environmental impact is acceptable if it achieves BNG. Key predictors of this positive opinion include trust in external expertise (wildlife charities and ecological consultants), belief in the assumptions underlying BNG, and existing knowledge of the BNG metric. This suggests that increasing trust in the organisations involved and improving public knowledge could enhance public support for BNG.

The public expressed a clear preference for a mixed approach to compensatory habitat creation, favouring a combination of habitat creation, restoration, and enhancement (62.2 %) over purely creating new habitats. There was also strong agreement that developers should be responsible for the creation and management of compensatory habitats (84 % somewhat or strongly agree), with a quarter of respondents somewhat or strongly disagreeing that developers should be able to purchase pre-existing biodiversity units. This indicates a desire for accountability and direct involvement from developers in managing biodiversity impacts.

While the English public supports the general concept of BNG,

limited knowledge, low trust in developers and governing bodies, and use of pre-existing biodiversity units may reduce acceptance of projects following mandatory BNG in practice. Our results suggest that key strategies to increase support include providing understandable information about how BNG works, involving trusted organisations, and ensuring developers are seen as taking responsibility for the creation and maintenance of compensatory habitats. These strategies, however, do not address fundamental criticisms of the metric and treating biodiversity as 'placeless,' nor the potential of BNG to facilitate developments that may not be in the communities' interests, meaning more research is required to understand how BNG may impact opinions on specific projects.

CRediT authorship contribution statement

Alice Stuart: Writing – original draft, Visualization, Methodology, Formal analysis. **Alan Bond:** Writing – review & editing, Supervision, Conceptualization. **Aldina M.A. Franco:** Writing – review & editing, Methodology, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used ChatGPT 4.0 in order to improve the readability of the abstract and conclusions. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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Declaration of competing interest

No conflicts of interest to declare.

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Appendix C. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvman.2025.127421>.

Data availability

The data used in this analysis, as well as a PDF copy of the questionnaire used to gather are available on FigShare (doi.org/10.6084/m9.figshare.27545187).

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In addition, I was joint first author on a publication stemming from my masters' degree:

Stuart, A. D., Ilić, M., Simmons, B. I., & Sutherland, W. J. (2024). Sea stack plots: Replacing bar charts with histograms. *Ecology and Evolution*, 14, e11237. <https://doi.org/10.1002/ece3.11237>

Appendix 2 Chapter Two Supporting Information

All data is available on figshare as a three sheet .xlsx file, they have not been included here due to substantial size:

Stuart, Alice (2022). conceptualising_SLO_supplementary_tables.xlsx. figshare. Dataset. <https://doi.org/10.6084/m9.figshare.20310945.v2>

Table S1: a complete list of the publications reviewed in this paper and whether they were used

Table S2: key conceptualisations that were not present in the Scopus database that have been added to this analysis.

Table S3: topics extracted from each reviewed paper

Appendix 3 Chapter Four Supporting Information

Appendix 3A – Supplementary information

Supplementary information is available on figshare (<https://figshare.com/s/6b57989c7002465e38ac>) and includes a pdf copy of the questionnaire, xlsx with tidied questionnaire responses, and html file containing all R code.

The questionnaire is also included below.

Questionnaire

1 Participant Information

Project Purpose: This questionnaire aims to understand how people in England view biodiversity net gain for a PhD study. Participants should be over 16 years old. No prior knowledge is needed; the questionnaire will provide the necessary information.

Do I have to take part? Participation is voluntary. If you choose to participate, you'll fill out a consent form. You can withdraw by not submitting the questionnaire. Once submitted, anonymity means we cannot withdraw an individual's data as we do not know who the data is associated with.

What will happen if I take part? After completing a short consent form, you'll fill out an online questionnaire with about 25 mostly multiple-choice questions, taking around 10 minutes. There are no direct personal benefits, but the research aims to improve biodiversity management practices. No discomfort, disadvantages, or risks are expected.

What if something goes wrong? If you encounter issues, need clarification, or want to raise a complaint, contact the Principal Researcher, Alice Stuart (astuart.research@uea.ac.uk). If unresolved, contact the UEA School of Environmental Sciences Ethics Officer, Dr Helen Pallett (h.pallett@uea.ac.uk), or the Head of the School of Environmental Sciences, Professor Ian Renfrew (i.renfrew@uea.ac.uk).

Data Protection Privacy Notice: This questionnaire does not collect any personally identifiable information. The data controller is the University of East Anglia. The University follows the Data Protection Act 2018 and UK GDPR principles, those who collect and use personal data on behalf of UEA must follow the data protection principles found in the UK GDPR and the University's Data Protection Policy (<https://my.uea.ac.uk/documents/20142/193428/Data+Protection+Policy+v4.0.pdf/b5d893d1-8207-6c07-6600-df3471524e52?t=1600426137040>). The University's registration number with the ICO is Z8964916, listed on the ICO website (<https://ico.org.uk/ESDWebPages/Entry/Z8964916>).

What will happen to the results of the research project? Results will be shared in academic outlets and possibly in general interest media. You won't be identifiable. To receive the results personally, contact the Principal Researcher, Alice Stuart (astuart.research@uea.ac.uk).

Who is organising and funding the research?

This research is conducted as part of a PhD grant awarded by the National Environmental Research Council (NERC) in CASE partnership with Anglian Water Services.

Thank you for reading this information sheet and for considering taking part in this research study. If you have any questions about the project or what you have read, please use the following contact details:
Alice Stuart
astuart.research@uea.ac.uk
School of Environmental Sciences, The University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, United Kingdom

On the next page you will be given a consent form for participation in this research

2 Consent form

Please tick 'yes' next to each of these statements to confirm you are eligible to take part in this research and are happy to take part.

	Yes	No
I confirm I am aged 16 years or older.	<input type="radio"/>	<input type="radio"/>
I confirm I live in England.	<input type="radio"/>	<input type="radio"/>
I confirm that I have read and understood the information provided on the previous page, I have had the opportunity to ask questions via email and I am happy with any answers received.	<input type="radio"/>	<input type="radio"/>
I understand that my participation is voluntary and that I am free to withdraw at any time up until the point I submit the questionnaire.	<input type="radio"/>	<input type="radio"/>
I understand that quotes from my responses may be used when writing up this study and that all quotes used will be anonymous.	<input type="radio"/>	<input type="radio"/>
I agree to take part in this study.	<input type="radio"/>	<input type="radio"/>

3.1 Filter

Unfortunately you are not eligible for this questionnaire.

4 Demographic information

What is your age?

16-24

25-34

35-44

45-54

55-64

65 or older

Which of the following best describes your gender identity?

- Female
- Male
- Non-binary / third gender
- Prefer not to say

What is the highest level of education you have completed?

If you are currently enrolled, please indicate the highest level received.

- No formal qualifications
- GCSEs or equivalent (e.g. O-levels, CSEs)
- A-levels or equivalent (e.g. IB, BTECs)
- Vocational higher education (e.g. NVQ level 4 or above, higher diplomas, higher national certificate, professional qualifications)
- Undergraduate degree (e.g. BA, BSc)
- Post-graduate degree, certificate, or diploma (e.g. Master's, PhD)

What letters does your postcode begin with?

Please only enter letters, for example "NR" for the postcode NR4 7TJ

5.1 quota full

Unfortunately we have reached the quota for respondents with your characteristics.

6 Biodiversity net gain intro

Please read the following information:

Biodiversity refers to the variety of all life on Earth, including all species of animals, plants, and other living things.

Habitats are the places in which species live.

Biodiversity net gain is defined as “an approach to development that leaves biodiversity in a better state than before”, in February 2024 it became a legal requirement in England for most developments requiring planning permission.

In England, biodiversity net gain is measured by comparing the value of habitats in ‘units’ before and after a development using a numeric metric. If the value after the development is higher, the development can claim it will achieve biodiversity net gain. This increase in unit value is achieved through creating, restoring, and/or enhancing habitat. These habitats will often take several years to reach their predicted value and must be maintained for at least 30 years.

How much of the above information did you know prior to starting this questionnaire?

None of the information

Some of the information

About half of the information

Most of the information

All of the information

Have you had any of the following experiences with projects aiming to achieve biodiversity net gain (BNG)?

(Please tick all that apply)

No experiences of projects aiming to achieve BNG

Interaction with a local project aiming to achieve BNG

Interaction with a non-local project aiming to achieve BNG

Interaction with BNG at work (industry)

Academic interaction with BNG

Other

Do you believe it is possible to create a net gain in biodiversity by creating, restoring and enhancing habitat after a development causes biodiversity loss?

Yes

No

Don't know

Other

7 The statutory metric

Please read the following information on the metric used in biodiversity net gain:

In England, biodiversity net gain will be measured using a tool called the Statutory Biodiversity Metric. This tool uses habitats to represent overall biodiversity and scores them based on their size, importance, and condition. For new or improved habitats, it also considers the risk of failure and the distance from where the original habitat was lost. After calculating, the tool gives the value of a habitat in "units." To meet the requirements for biodiversity net gain, the number of units after development must be at least 10% higher than before.

How much do you know about the Statutory Biodiversity Metric in England?

I had not heard of it prior to this questionnaire

I have heard of it but do not know any details

I am somewhat informed

I am well informed

Would you like to be given more information on the Statutory Biodiversity Metric?

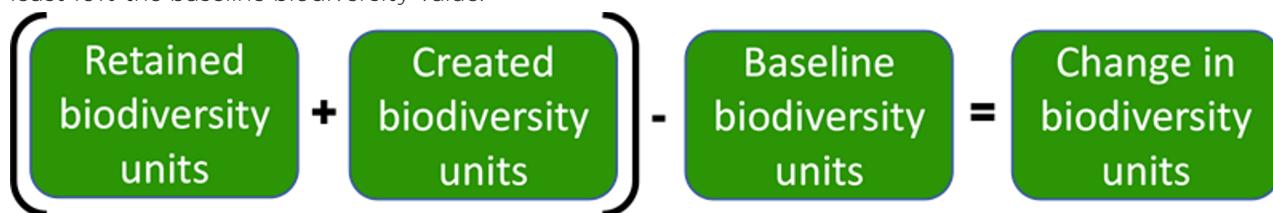
Yes

No

8 Statutory metric cont.

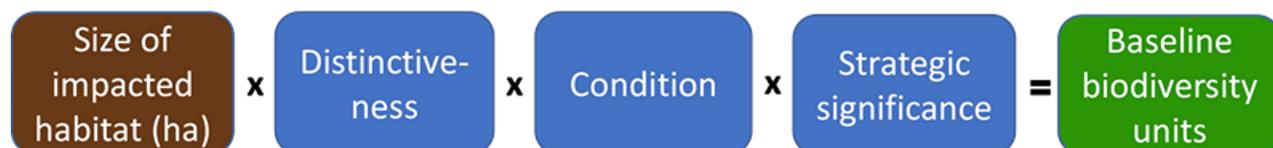
Please read this additional information on biodiversity net gain:

The net biodiversity change is the habitat value after development (any retained habitat that was there originally + newly created and/or enhanced habitat) minus the baseline habitat value before development. To achieve biodiversity net gain in England, a project must result in a positive net biodiversity change of at least 10% the baseline biodiversity value.



Baseline biodiversity value:

The baseline unit calculation uses the size of the development site and three habitat features: **distinctiveness** (the relative scarcity of the habitat and its importance for nature conservation); **condition** (how good an example of the habitat type it is); and the **strategic significance** (how important the habitat is in that location). The baseline includes all habitat that will be impacted by the development, including land that will be used for compensation.



Biodiversity value after development:

Retained Biodiversity Units:

The amount of original habitat remaining after development, calculated using the same formula as baseline biodiversity value.

Created Biodiversity Units:

For habitat creation and enhancement, there are additional uncertainties and a risk of failure to create or improve the biodiversity unit value of a habitat. In the metric, these risks are accounted for using further multipliers: **difficulty** (the difficulty and uncertainty of successfully creating, restoring, or enhancing a habitat); **time to target condition** (accounts for the time lag between the negative impact on biodiversity and the compensation reaching the required quality); and **off-site risk** (to disincentivise habitat being provided a large distance from the habitat that has been damaged). As the risk multipliers are set to values less than or equal to 1, this will typically increase the size of the habitat required as compensation above the size of habitat lost or damaged.



Do you believe it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric?

Yes

No

Don't know

Other

How effective do you believe the Statutory Biodiversity Metric is as a method to measure biodiversity?

Very ineffective

Somewhat ineffective

Somewhat effective

Very effective

Don't know

9 Compensatory habitat

Please read the following information on compensation approaches:

Developers have several ways to achieve biodiversity net gain and offset losses. They can:

- Create, enhance, or restore habitat on their own land.
- Pay others to create, enhance, or restore habitat elsewhere.
- Purchase biodiversity units from a habitat bank or private landowner.
- As a last resort, if these options are not feasible, developers can buy 'statutory biodiversity credits', the money from which supports national biodiversity projects.

Would you rather compensatory biodiversity improvements were made through:

Creating new habitats

Restoring and enhancing existing habitats

A mixture of habitat creation, restoration, and enhancement

Other

To what extent do you believe the developer should:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Be responsible for habitat creation and management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create and manage habitat themselves	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be able to pay others to create and manage habitats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be able to buy pre-existing units from others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10 Habitat types

Please read the following information on habitat types:

Within biodiversity net gain, trading rules decide what type of habitat can be used to compensate for losses. These rules ensure low-value habitats aren't used to replace high-value ones and that biodiversity net gain cannot be achieved if very high distinctiveness habitats are lost.

The trading rules for mandatory biodiversity net gain in England are:

1. Low and very low distinctiveness habitats, like most agricultural land, can be compensated with any habitat of equal or higher distinctiveness.
2. Medium distinctiveness habitats, like neutral grasslands, must be compensated with a habitat of the same broad type and equal or higher distinctiveness.
3. High distinctiveness habitats, like lowland mixed deciduous woodland, must be compensated with the same habitat type.
4. Very high distinctiveness habitats, like ancient woodlands, are deemed irreplaceable. A project can't claim net gain if these habitats are damaged.

If you could choose the habitat types created, restored, or enhanced to provide biodiversity net gain for a project, what would be the most important factors?

Please click and drag these statements to rank them from most important at the top to least important at the bottom.

Habitat should be the same type as that which was lost

Habitat should be the best value for money

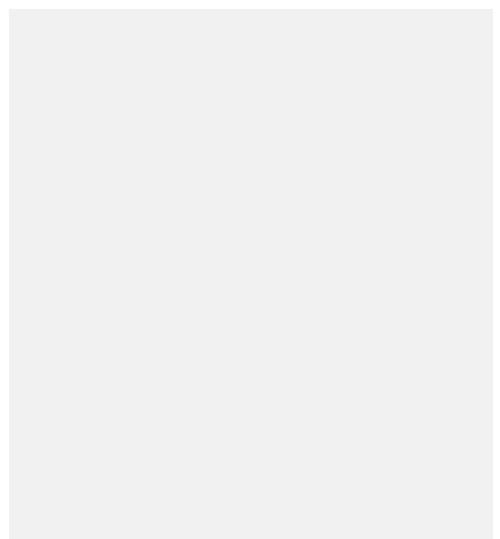
Habitat should be of high national importance

Habitat should be of high importance in the area where the loss occurred

Habitat should provide access to nature

Habitat should benefit the species impacted by the loss of habitat

Habitat should be of at least the same distinctiveness/rarity as what was lost



How strongly do you feel that the above ranking is followed?

Very strongly

Somewhat strongly

Not at all strongly

11 Habitat locations

Please read the following information on habitat locations:

Developers can choose where to create compensatory habitat, but they need to create more if it's outside the same local planning authority or ecological network, due to the 'off-site risk' multiplier in the metric. They can place compensation: On the development site (within the red line boundary in the planning application); or off-site, which might be cheaper or offer greater benefits for people and biodiversity.

If you could choose the location of the habitat created, restored, or enhanced to provide biodiversity net gain for a project, what would be the most important factors?

Please click and drag these statements to rank them from most important at the top to least important at the bottom.

- Habitat should be on the site of the development
- Habitat should be as close as possible to the location of the loss
- Habitat should be located where it has the greatest overall benefit for biodiversity
- Habitat should be located where it has the greatest overall benefit for people
- Habitat should be located where it has the greatest benefit for the people impacted by the project
- Habitat should be located where it has the greatest benefit for the animals and plants impacted by the project



How strongly do you feel that the above ranking is followed?

- Very strongly
- Somewhat strongly
- Not at all strongly

12 Actors

Please read this information on the actors involved in biodiversity net gain:

Many actors will be involved in biodiversity net gain, the main actors and their roles will be:

- **Developers:** Create and purchase biodiversity units to compensate for development losses.
- **Local Planning Authorities:** Assess and enforce biodiversity net gain proposals.
- **Ecological Consultants:** Help developers plan their biodiversity net gain.
- **Wildlife Charities:** Assist in designing plans, providing compensatory units, and monitoring site management.
- **Private Landowners:** Create and sell habitat improvements or enter agreements with developers for compensation.
- **Government Agencies (Defra and Natural England):** Develop tools and manage biodiversity net gain, including selling statutory biodiversity units.
- **Central Government:** Set the policy direction for biodiversity net gain.

To what extent do you trust these actors regarding their involvement in biodiversity net gain?

	Strongly distrust	Somewhat distrust	Neutral	Somewhat trust	Strongly trust
Developers	<input type="radio"/>				
Local planning authorities	<input type="radio"/>				
Ecological consultants	<input type="radio"/>				
Wildlife charities	<input type="radio"/>				
Private landowners	<input type="radio"/>				
Government agencies	<input type="radio"/>				
Central government	<input type="radio"/>				

13 Overall opinions

What is your opinion of biodiversity net gain as an approach to the environment?

- Extremely negative
- Somewhat negative
- Neither positive nor negative
- Somewhat positive
- Extremely positive

Do you agree or disagree that biodiversity net gain will improve nature in England?

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

Do you agree or disagree that a project's impact on nature is acceptable if it achieves biodiversity net gain?

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

Is there anything that would, in your opinion, improve biodiversity net gain as an approach?

Has any of the information in this questionnaire changed your views on biodiversity net gain?

Yes

No

If your views changed, please describe how your views have changed and what information changed them

14 Final page

Thank you for taking part in this research, if you have any questions please email astuart.research@uea.ac.uk
If you are interested in finding out more about biodiversity net gain, more information can be found at the following sites:

<https://www.gov.uk/guidance/understanding-biodiversity-net-gain>

<https://www.local.gov.uk/pas/topics/environment/biodiversity-net-gain-local-authorities/biodiversity-net-gain-faqs>

<https://ukgbc.org/resources/biodiversity-net-gain-actor-and-resource-map/>

Appendix 3B – Description of Sample

Table 3B.1: Quotas for age and gender used within data collection. Quotas were calculated using Office for National Statistics data (<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/ukpopulationpyramidinteractive/2020-01-08>) implemented as maxima to account for non-binary participants and those who do not want to provide demographic information.

Age	Gender Identity	Proportion	Number
16-24	male	0.07	33
16-24	female	0.06	31
25-34	male	0.08	42
25-34	female	0.08	41
35-44	male	0.08	40
35-44	female	0.08	40
45-54	male	0.08	41
45-54	female	0.08	41
55-64	male	0.08	38
55-64	female	0.08	39
65 or older	male	0.10	51
65 or older	female	0.12	61

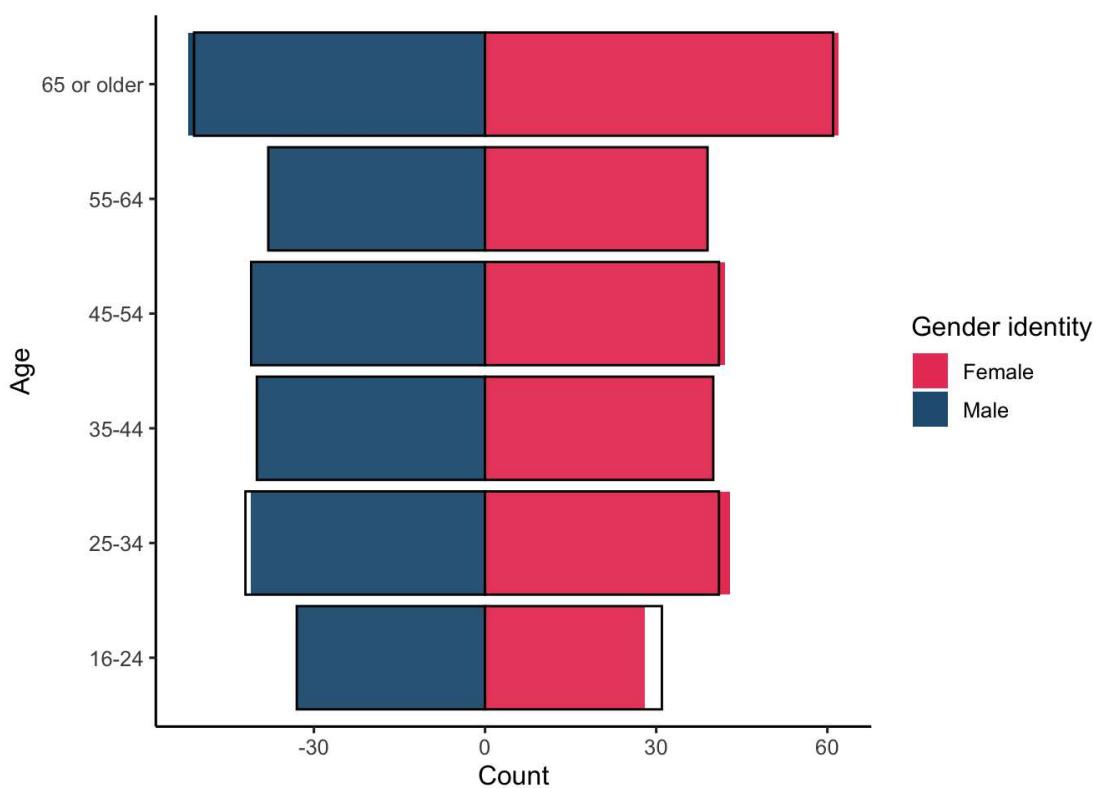


Figure 3B.2: Distribution of sample between age and gender categories (shown in solid blue and pink bars) compared with intended quota (shown as hollow black bar outline).

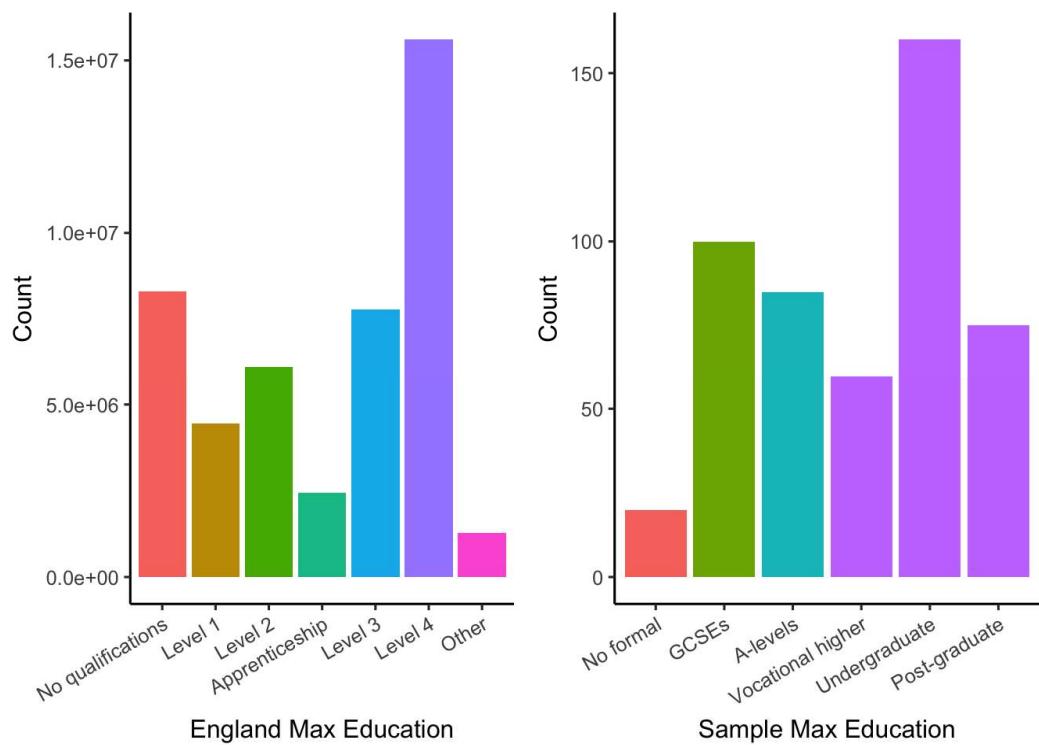


Figure 3B.2: Comparison of highest level of education within the English population as a whole, according to the 2021 Census data (a), and my sample (b). Note that direct comparison is not possible due to different levels. Education levels within the census data are Level 1 and entry level qualifications: 1 to 4 GCSEs grade A to C or grade 4 and above, any GCSEs at other grades, O levels or CSEs (any grades), 1 AS level, NVQ level 1, Foundation GNVQ, Basic or Essential Skills; Level 2 qualifications: 5 or more GCSEs (A* to C or 9 to 4), O levels (passes), CSEs (grade 1), School Certification, 1 A level, 2 to 3 AS levels, VCEs, Intermediate or Higher Diploma, Welsh Baccalaureate Intermediate Diploma, NVQ level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First or General Diploma, RSA Diploma; Level 3 qualifications: 2 or more A levels or VCEs, 4 or more AS levels, Higher School Certificate, Progression or Advanced Diploma, Welsh Baccalaureate Advance Diploma, NVQ level 3, Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND, BTEC National, RSA Advanced Diploma; Level 4 qualifications and above: degree (BA, BSc), higher degree (MA, PhD, PGCE), NVQ level 4 to 5, HNC, HND, RSA Higher Diploma, BTEC Higher level, professional qualifications (for example, teaching, nursing, accountancy); Other: vocational or work-related qualifications, other qualifications achieved in England or Wales, qualifications achieved outside England or Wales (equivalent not stated or unknown).*

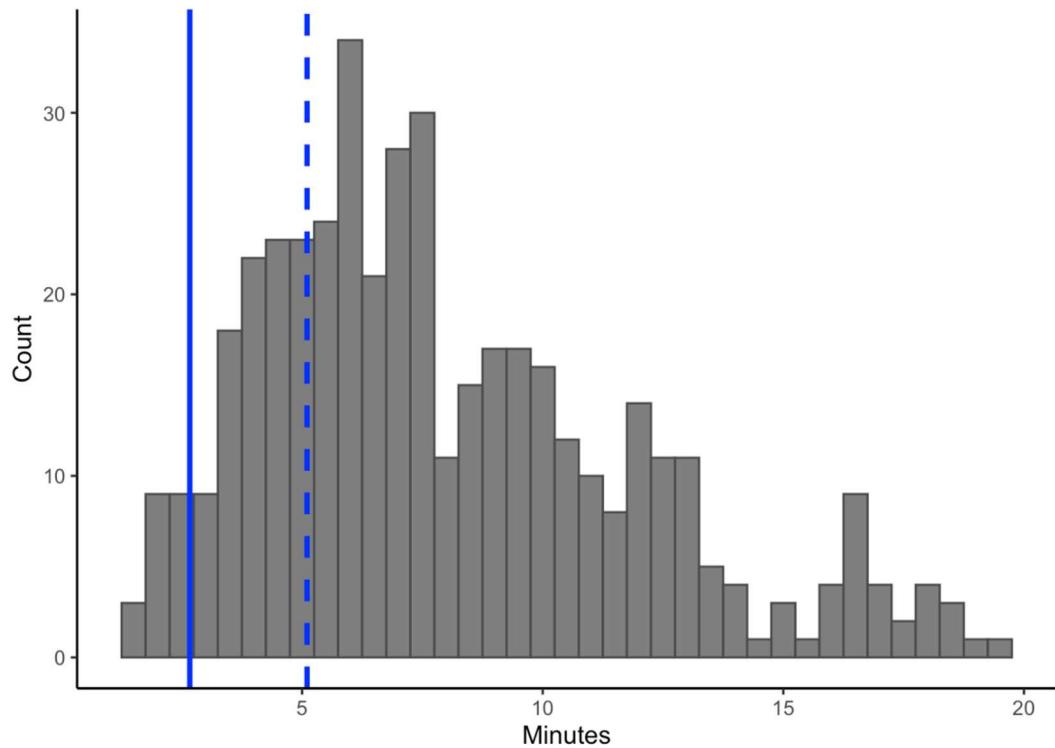


Figure 3B.3: Time taken to complete the survey (for respondents who completed it in one go), dashed blue line shows the cutoff for 'up to 70% median speeders' (5.1 minutes) and solid blue line shows the cutoff for 'extreme speeders' (2.67 minutes). Respondents who took longer than 20 minutes (37) have not been shown. The questionnaire has approximately 2800 total words, approx. 400 of which are the participant information, 250 the optional metric text, 950 the non-optional introductory text for each topic, and the final 1200 the questions themselves. I was expecting the questionnaire to take around 10 minutes. Assuming a reading speed of 238wpm (Brysbaert), it should take 11.8 minutes to read all text or 5.0 minutes to read just the questions. Assuming the disputed "skimming" speed of 450wpm from Carver (per Brysbaert), it should take 6.2 minutes to skim the whole text or 2.7 minutes to skim just the questions.

Appendix 3C – Correlation Plots

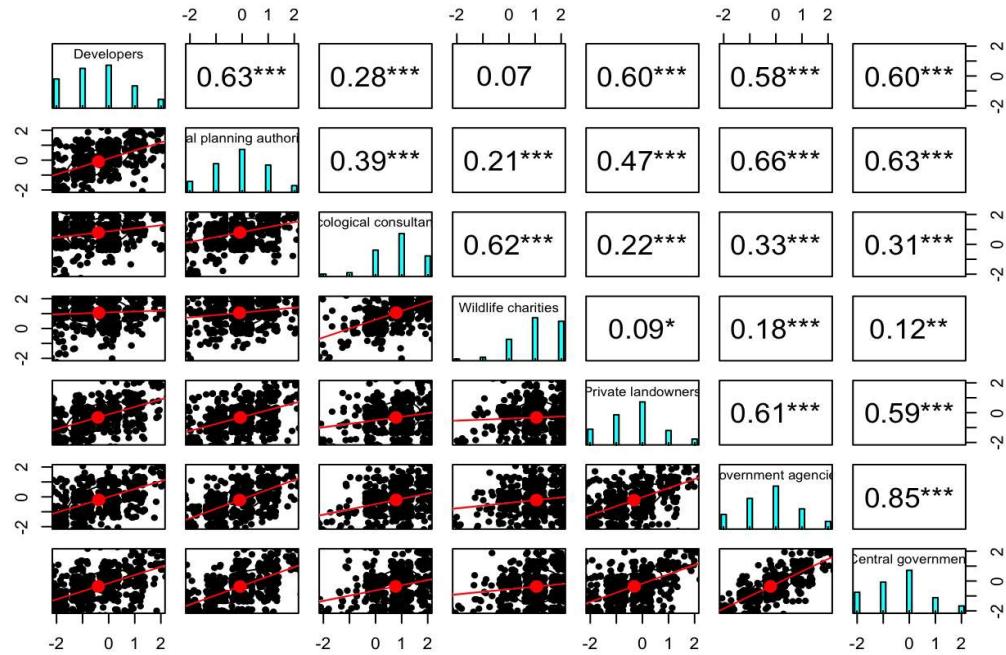


Figure 3C.1: Correlations between trust in all pairs of actors, showing scatterplots with linear model (bottom left); histogram of values (diagonal top left to bottom right); and correlation coefficients with significance shown using astrices (top right).

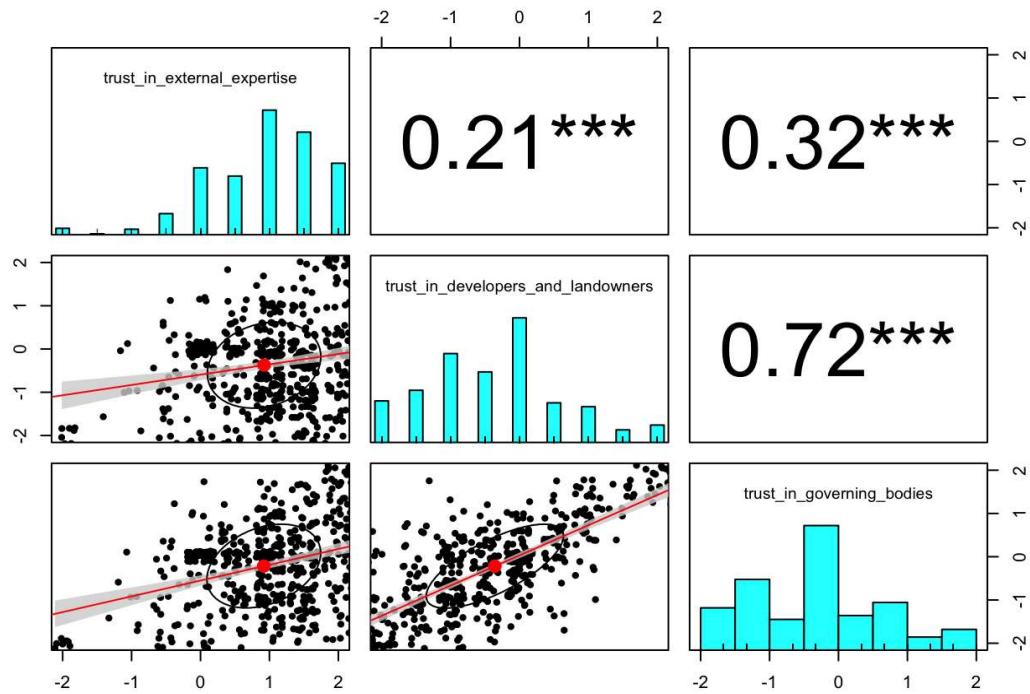


Figure 3C.2: Correlations between trust in the three simplified actor groups, showing scatterplots with linear model (bottom left); histogram of values (diagonal top left to bottom right); and correlation coefficients with significance shown using astrices (top right).

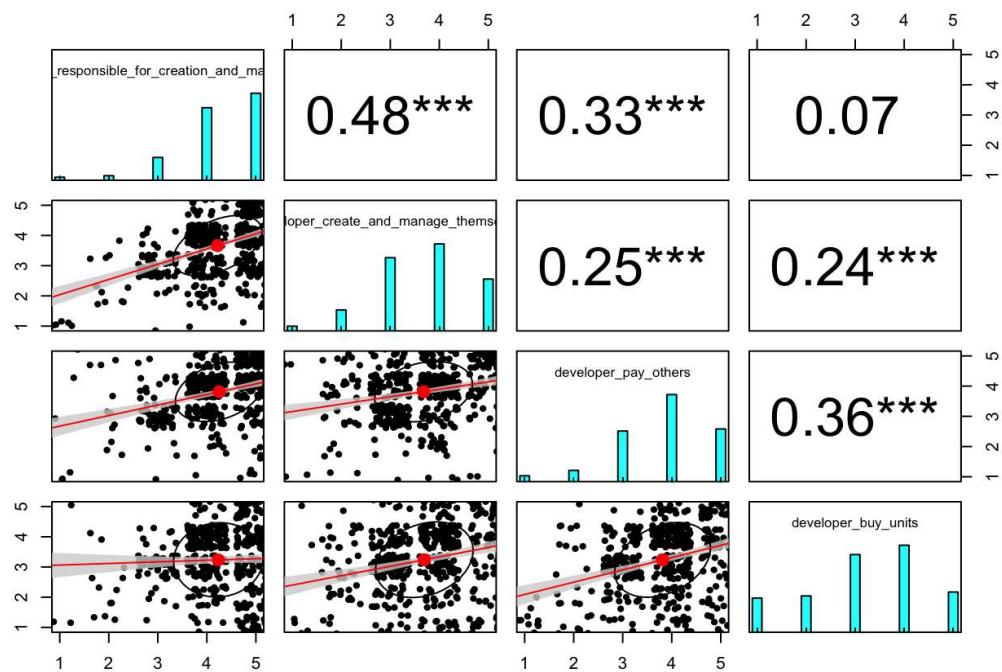


Figure 3C.3: Correlations between each of the developer responsibilities, showing scatterplots with linear model (bottom left); histogram of values (diagonal top left to bottom right); and correlation coefficients with significance shown using astrices (top right).

Appendic 3D – Supplementary Modelling

3D.1 Modelling Measurement Belief

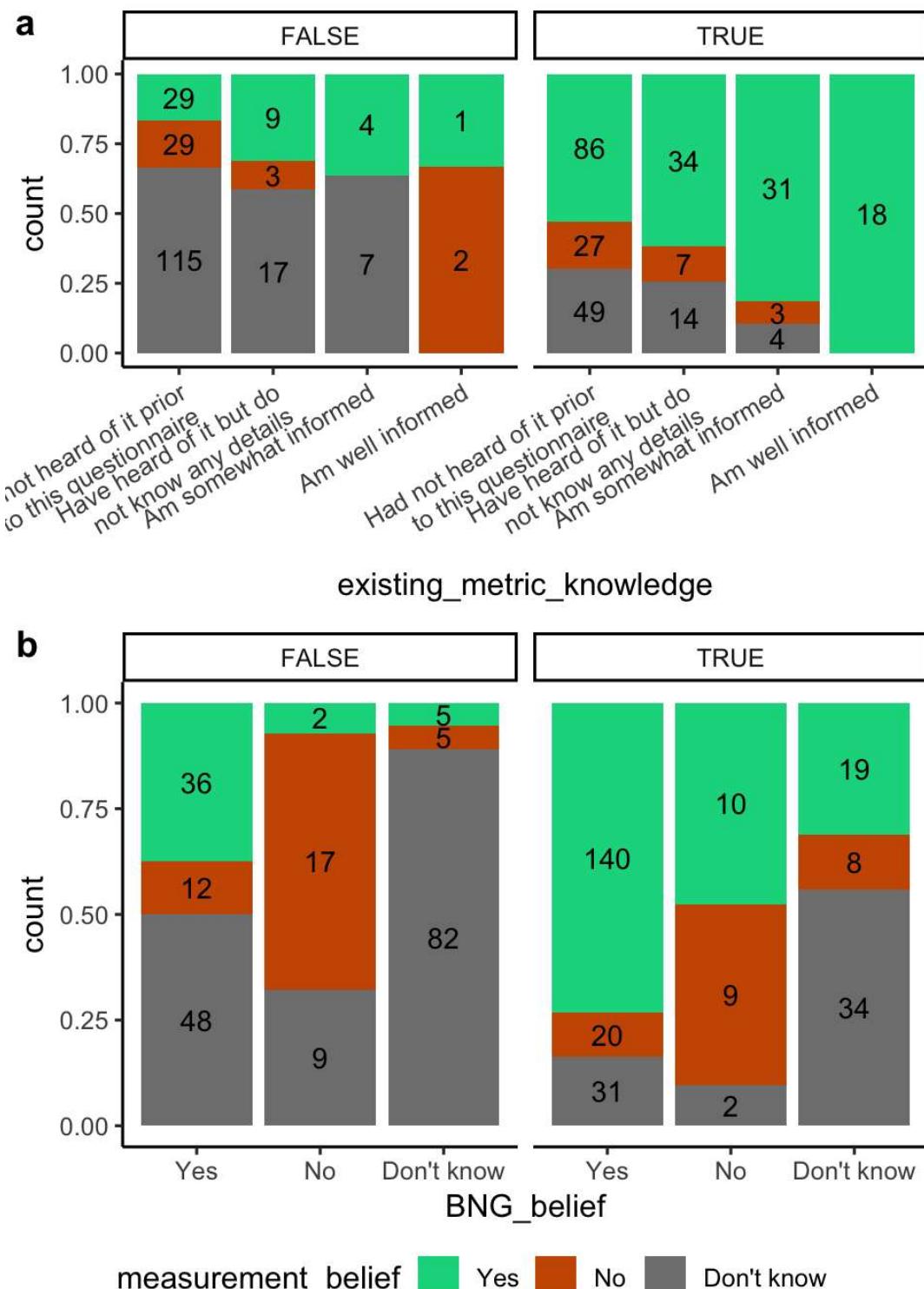


Figure 3D.4: Differences in measurement belief between respondents who did not (FALSE) and did (TRUE) choose to see the metric text, split by existing knowledge of the statutory metric (a) and their BNG belief (B).

The below shows the model coefficients for the measurement belief know/don't know model and yes/no models. In all model read outs, where an ordered factor variable is followed by 'L', 'Q' these refer to the linear and quadratic terms respectively. The variables used were as follows:

- *existing_metric_knowLedge*: how much the respondent said they knew about the statutory biodiversity metric (ordered factor, levels = “had not heard of it prior to this questionnaire”, “Have heard of it but do not know any details”, “Am somewhat informed”, “Am well informed”)
- *metric_info*: whether the respondent chose to see the optional additional information on the statutory biodiversity metric
- *BNG_belief*: whether the respondent believed it is possible to achieve a net gain in biodiversity after a loss due to development (factor, levels = “Yes”, “No”, “Don't know”)

```
##  
## Call:  
## glm(formula = measurement_belief_dont_know ~ existing_metric_kno  
wledge +  
##     metric_info + BNG_belief, family = "binomial", data = modell  
ing_data %>%  
##     mutate(measurement_belief_dont_know = measurement_belief ==  
##             "Don't know"))  
##  
## Coefficients:  
##                                     Estimate Std. Error z value Pr(>|z|)  
## (Intercept)                 -4.3415   200.3157 -0.022  0.9827  
## existing_metric_knowledge.L -11.4889   537.5033 -0.021  0.9829  
## existing_metric_knowledge.Q -7.9449   400.6314 -0.020  0.9842  
## metric_infoTRUE              -1.6019     0.2310 -6.933 4.11e-12  
***  
## BNG_beliefNo                -0.7973     0.3986 -2.000  0.0455  
*  
## BNG_beliefDon't know        1.9023     0.2509  7.581 3.43e-14  
***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## (Dispersion parameter for binomial family taken to be 1)
```

```

## Null deviance: 665.72 on 488 degrees of freedom
## Residual deviance: 481.41 on 482 degrees of freedom
## AIC: 495.41
##
## Number of Fisher Scoring iterations: 16

##
## Call:
## glm(formula = measurement_belief_yes ~ existing_metric_knowledge +
##     metric_info + BNG_belief, family = "binomial", data = modelling_data %>%
##     mutate(measurement_belief_dont_know = measurement_belief ==
##           "Don't know", measurement_belief_yes = measurement_belief ==
##           "Yes") %>% filter(!measurement_belief_dont_know))
##
## Coefficients:
##                               Estimate Std. Error z value Pr(>|z|)
## (Intercept)               1.52442   0.37716  4.042 5.30e-05
## existing_metric_knowledge.L 1.21225   0.59024  2.054  0.03999
## existing_metric_knowledge.Q -0.03706   0.56004 -0.066  0.94724
## existing_metric_knowledge.C -0.24927   0.52230 -0.477  0.63318
## metric_infoTRUE            0.95914   0.32889  2.916  0.00354
## BNG_beliefNo              -2.29663   0.42727 -5.375 7.65e-08
## BNG_beliefDon't know      -0.97841   0.40800 -2.398  0.01648
##
## ---
## Signif. codes:  0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
## Null deviance: 318.83 on 282 degrees of freedom
## Residual deviance: 254.92 on 276 degrees of freedom
## AIC: 268.92
##
## Number of Fisher Scoring iterations: 5

```

There was some difference in the estimates depending on the speeding threshold used (full sample: estimate = 1.0 ± 0.3 , $p = 0.004$; “extreme speeders” removed: estimate = 0.9 ± 0.3 , $p = 0.01$; “up to 70% median speeders” removed: estimate = 0.7 ± 0.4 , $p = 0.07$).

3D.2 Modelling Overall Opinion

I conducted an ordinal logistic analysis to investigate which factors predict a respondent's overall opinion of BNG using the following predictor variables:

- *BNG_belief*: whether the respondent believed it is possible to achieve a net gain in biodiversity after a loss due to development (factor, levels = “Yes”, “No”, “Don’t know”)
- *measurement_belief*: whether the respondent believed it is possible to measure and compare biodiversity using a standardised numeric metric (factor, levels = “Yes”, “No”, “Don’t know”)
- *BNG_experience*: whether the respondent reported having experience with a project aiming to achieve BNG
- *existing_metric_knowledge*: how much the respondent said they knew about the statutory biodiversity metric (ordered factor, levels = “had not heard of it prior to this questionnaire”, “Have heard of it but do not know any details”, “Am somewhat informed”, “Am well informed”)
- *metric_info*: whether the respondent chose to see the optional additional information on the statutory biodiversity metric (factor, levels = “Yes”, “No”)
- *BNG_existing_knowledge*: how much of the text given on BNG the respondent reported having already known (levels: “None of the information”, “Some of the information”, “About half of the information”, “The majority of the information”, “All of the information”)
- *trust_in_external_exoertise*: arithmetic mean of the Likert-type responses to extent of trust in wildlife charities and ecological consultants (original question Likert-type, levels = “Strongly distrust”, “Somewhat distrust”, “Neither trust nor distrust”, “Somewhat trust”, “Strongly trust”; this variable numeric -2 to 2)
- *trust_in_developers_and_Landowners*: as above for developers and private landowners
- *trust_in_governing_bodies*: as above for central government, local planning authorities, and government agencies

- *age*: respondent's age (ordered factor, levels = “16-24”, “25-34”, “35-44”, “45-54”, “55-64”, “65 or older”)
- *gender_identity*: respondent's gender identity (factor, levels = “female”, “male”)
- *education*: respondent's reported highest level of educational attainment (ordered factor, levels = “No formal qualifications”, “GCSEs or equivalent (e.g. O-levels, CSEs)”, “A-levels or equivalent (e.g. IB, BTECs)”, “Vocational higher education (e.g. NVQ level 4 or above, higher diploma, higher national certificate, professional qualifications)”, “Undergraduate degree (e.g. BA, BSc)”, “Postgraduate degree (e.g. Master's, PhD)”)

The predictor variables were tested a priori to assess multicollinearity (see Table 3D.1). As the predictor variables primarily consisted of factors with more than two levels, it is appropriate to use adjusted generalised standard error inflation factor (aGSIF) as a measure of co-variance instead of generalised variance inflation factor (GVIF) (see e.g. <https://bookdown.org/rwnahhas/RMPH/mlr-collinearity.html>); all aGSIF values were below 1.6 meaning that, although some covariance was present, it was acceptably low (Nahhas, 2024).

Table 3D.1: Generalised variance inflation factor (GVIF) and adjusted generalised standard error inflation factor (aGSIF) values for all variables included in the global opinion model.

Variable	GVIF	Df	aGSIF
BNG_belief	1.750673	2	1.150274
measurement_belief	1.915029	2	1.176370
BNG_experience	1.848182	1	1.359479
BNG_existing_knowledge	2.544760	4	1.123843
existing_metric_knowledge	2.904596	3	1.194486
trust_in_external_expertise	1.313497	1	1.146079
trust_in_developers_and_landowners	2.473692	1	1.572798
trust_in_governing_bodies	2.389342	1	1.545750
age	1.648388	5	1.051250
gender_identity	1.083729	1	1.041023

Variable	GVIF	Df	aGSIF
education	1.668799	5	1.052544

The global ordinal regression was dredged to select the best models based on their Aichi Information Criterion (AIC). This process tests all combinations of predictor variables to assess the combination with the best model fit. The predictor variables and their significance for all models with delta AIC less than or equal to two are shown in Table 3D.2. These models cannot be considered to be significantly different to one another, but it is of note that all three best-fit models are very similar and thus we can be confident in drawing conclusions around the significance and direction of correlation for the included predictor variables.

Table 3D.2: Table of variables included in selected models of overall opinion of BNG, their log-odds ratio, and their significance (p <= 0.05.; ** p <= 0.01; *** p <= 0.001).*

Variable	Model 1 (AIC = 925.1)	Model 2 (AIC = 925.9)	Model 3 (AIC = 926.6)
measurement_beliefNo	-1.28***	-1.28***	-1.27***
measurement_beliefDon't know	-0.85***	-0.84***	-0.82***
trust_in_external_expertise	1.22***	1.23***	1.23***
trust_in_governing_bodies	0.37***	0.36**	0.36**
education.L	1.04**	1.04**	1.03**
education.Q	-0.71*	-0.7*	-0.71*
existing_metric_knowledge.L	0.98*	0.95*	0.87*
existing_metric_knowledge.Q	0.87**	0.88**	0.89**
BNG_beliefNo	-0.65	-0.64	-0.65
BNG_beliefDon't know	-0.7**	-0.68**	-0.68**
gender_identityMale		0.21	
BNG_experienceYes			0.22

Also of interest was direction of opinion, that is whether the respondent answered negatively, neutrally, or positively. Direction of opinion shared the

same predictors, other than existing metric knowledge, which was not significant (Table 3D.3). As with the model of overall opinion, the predictors in all best fit models are very similar, with the only major difference being the inclusion of trust in financial beneficiaries as opposed to governing bodies in Model 5. This means we can be confident in drawing conclusions around the direction and significance of predictor variables.

Table 3D.3: Table of variables included in selected models of direction of overall opinion of BNG, their log-odds ratio, and their significance (p <= 0.05.; ** p <= 0.01; *** p <= 0.001).*

Variable	Model 1 (AIC= 602.5)	Model 2 (AIC= 602.6)	Model 3 (AIC= 603.3)	Model 4 (AIC= 603.8)	Model 5 (AIC= 604.0)	Model 6 (AIC= 604.3)
BNG_beliefNo	-0.78*	-0.85*	-0.78*	-0.85*	-0.85*	-0.77*
BNG_beliefDon't know	- 0.75**	-0.71**	-0.71**	-0.73**	-0.74**	-0.74**
BNG_experience Yes	-0.58			-0.34		-0.58
education.L	1**	1.06**	0.94**	1.09**	1.09**	1**
education.Q	-1.1**	-1.11**	-1.11**	-1.12**	-1.08**	-1.1**
measurement_beliefNo	- 1.59**	1.61***	1.49***	1.65***	1.65***	-1.59***
measurement_beliefDon't know	- 1.24**	- 1.21***	- 1.08***	- 1.27***	- 1.24***	-1.23***
trust_in_external_expertise	1.21** *	1.2***	1.23***	1.19***	1.23***	1.21***
trust_in_governing_bodies	0.32*	0.32*	0.28*	0.33*		0.32*
existing_metric_knowledge.L		-0.17		-0.04	-0.16	
existing_metric_knowledge.Q		0.49		0.45	0.52	
trust_in_financial_beneficiaries					0.28*	
gender_identity_Male						0.09

To understand whether the importance of trust in external expertise was genuine, or whether it was measuring the respondent's overall propensity to trust, I re-ran the model including trust as *average_trust*, the mean trust assigned across all seven actors, and "residual" trust for each actor group, calculated as the average trust across the group of actors (e.g. governing bodies) minus *average_trust*. The predictor variables were tested a priori to assess multicollinearity, a high level of correlation was found between residual trust in governing bodies and residual trust in private organisations, so two models were run to separate these two variables. The two global ordinal regression were dredged to select the best models based on AIC, the predictor variables and their significance for all models with delta less than or equal to two are shown in Table 7.4. Across all best fit models, both average trust and residual trust in external expertise had a significant positive effect on overall opinion of BNG, leading to the conclusion that respondent's level of trust in external expertise had an impact beyond being a proxy for the respondent's general propensity to trust. Visual comparisons of trust in external expertise with average trust and trust in the other actors are shown in Figure 4.7.9.

Table 3D.4: Table of variables included in selected models of overall opinion of BNG (where trust is included as average and residual), their log-odds ratio, and their significance (p <= 0.05.; ** p <= 0.01; *** p <= 0.001).*

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	(AIC= 926.4)	(AIC= 927.0)	(AIC= 927.1)	(AIC= 927.1)	(AIC= 928.0)	(AIC= 927.9)	(AIC= 927.9)
average_trust	1.6 ***	1.61 ***	1.58 ***	1.58 ***	1.6 ***	1.59 ***	1.59 ***
residual_trust_in _ external_experti se	1.08 ***	1.09 ***	0.97 ***	1.23 ***	1.09 ***	1.23 ***	0.99 ***
residual_trust_in _ developers_and_ landowners				-0.26			-0.24
residual_trust_in _ governing_bodie s					0.39		0.36
BNG_beliefNo	-0.64	-0.63	-0.65	-0.65	-0.64	-0.64	-0.64
BNG_beliefDon't know	-0.71 **	-0.69 **	-0.7 **	-0.7 **	-0.7 **	-0.68 **	-0.68 **
education.L	1.06 **	1.06 **	1.04 **	1.04 **	1.04 **	1.04 **	1.04 **
education.Q	-0.7 *	-0.69 *	-0.71 *	-0.71 *	-0.7 *	-0.7 *	-0.7 *
existing_metric_ knowledge.L	0.92 *	0.89 *	0.98 *	0.98 *	0.83 *	0.95 *	0.95 *
existing_metric_ knowledge.Q	0.87 **	0.88 **	0.87 **	0.87 **	0.89 **	0.88 **	0.88 **
measurement_ beliefNo	-1.3 ***	-1.31 ***	-1.28 ***	-1.28 ***	-1.3 ***	-1.28 ***	-1.28 ***
measurement_ beliefDon't know	-0.87 ***	-0.86 ***	-0.85 ***	-0.85 ***	-0.85 ***	-0.84 ***	-0.84 ***
gender_identity Male		0.23				0.21	0.21
BNG_experience Yes					0.2		

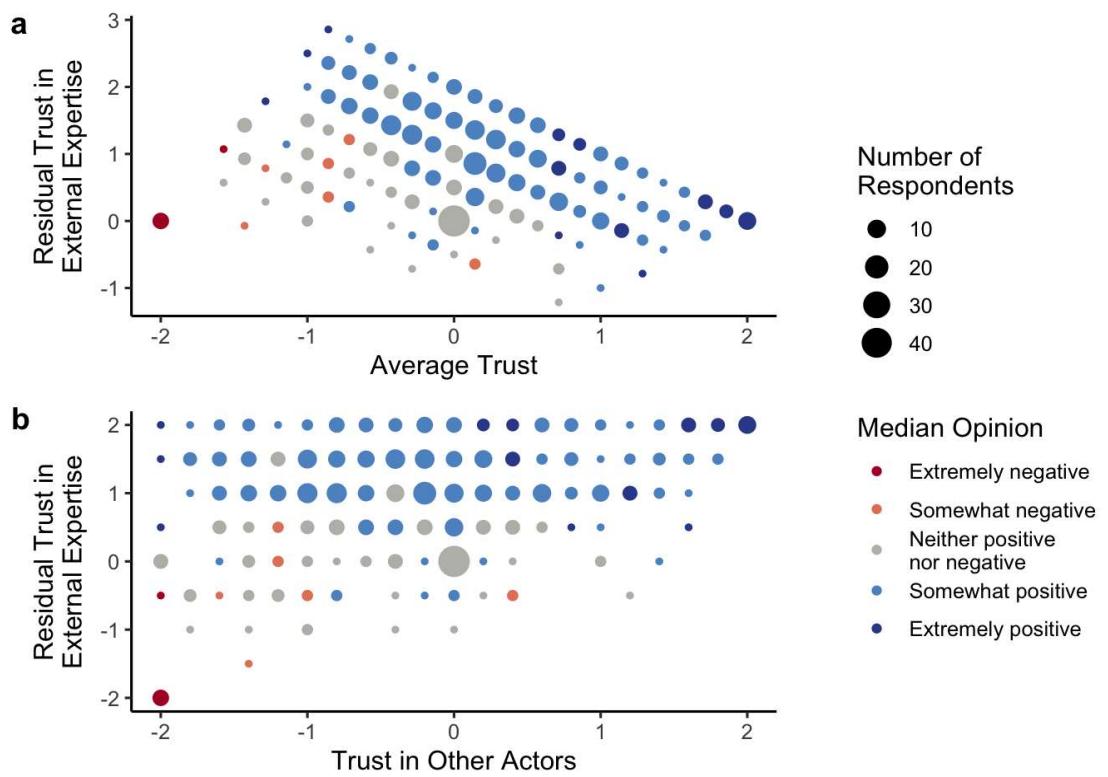


Figure 3D.5: Two alternative plots for trust: (a) plotting residual trust in external expertise (i.e. the difference between average trust assigned to external expertise and average trust assigned across all organisations); and (b) plotting average trust in external expertise against average trust in all other actors. In both plots, colour is used to show median overall opinion and size is used to show the number of respondents with those values for trust.

Appendix 4 Chapter 5 Supporting Information

4.A – Supplementary files

The files for Appendix A are available on figshare
(<https://figshare.com/s/457b92d4a3ccfe09ad4c>)

Appendix 4A.1 – EIR2021/28831

EIR2021/28831_response.pdf – Defra response justifying not sending information



Department
for Environment
Food & Rural Affairs

Nobel House
Area 1E
17 Smith Square
London
SW1P 3JR

T: 03459 33 55 77
helpline@defra.gov.uk
www.gov.uk/defra

Alice Stuart
By email: Alice.Stuart@uea.ac.uk

Our ref: EIR2021/28831
20 December 2021

Dear Alice Stuart,

REQUEST FOR INFORMATION: Responses to Net Gain Consultation

Thank you for your request for information of 26 November 2021 about responses to the net gain consultation. We have handled your request under the Environmental Information Regulations 2004 (EIRs).

The EIRs apply to requests for environmental information, which is a broad category of information defined in regulation 2 of the EIRs. Public authorities are required to handle requests for environmental information under the EIRs. They give similar access rights to the Freedom of Information Act 2000 (FOIA).

Your information request and our response are set out below.

“I would like to make a Freedom of Information request to access electronic copies of the responses to the DEFRA consultation on net gain held from 2nd Dec 2018 to 10th Feb 2019.”

We want to be as open as possible in answering requests. The EIRs also require us to provide advice and assistance to help people obtain the information they are looking for and make good use of the EIRs.

The government published a summary of all 470 consultation responses received to the Biodiversity Net Gain consultation in 2019. This can be found here:

<https://www.gov.uk/government/consultations/biodiversity-net-gain-updating-planning-requirements>

A list of all organisations that responded to the consultation is included on pages 86-90.

Unfortunately, your request is very broad and covers a large amount of information. Gathering and reviewing all 470 consultation responses would involve a significant cost and diversion of resources from the Department's other work.

By virtue of regulations 12(1) and 12(4)(b) of the EIRs, Defra may refuse to disclose environmental information if the request for the information is manifestly unreasonable and, in all the circumstances of the case, the public interest in maintaining the exception outweighs the public interest in disclosing the information.

We consider that your request is manifestly unreasonable under regulation 12(4)(b) on cost grounds and, having carried out the above public interest test, we have concluded that, in all the circumstances of the case, the public interest falls in favour of maintaining the exemption.

In reaching our decision with respect to the public interest, we considered the following matters.

We recognise that there is a public interest in the disclosure of information. We have published a summary of all consultation responses received in December 2019. We understand that release of information aids accountability and transparency of government and any further public understanding of the issues involved. However, we consider this is outweighed by the stronger public interest in maintaining the exception.

Your request is broad in nature across a consultation document that asked 45 questions. We would need to go through each of the 470 responses to review the content to check if there are any sensitivities over the release of the information. It would involve a significant burden for Defra to process and we would have to divert resources from the provision of public services, i.e. the department's core functions, to fully answer your request. On that basis we estimate it would take well in excess of 117 hours (assuming an average of 15 mins to review each response) to review and consider the information requested. We have therefore concluded that due to this burden the public interest in withholding the requested information, for the reasons outlined, outweighs the public interest in its disclosure.

Regulation 9 of the EIRs requires public authorities to provide advice and assistance to applicants where reasonable. We have therefore provided details below to assist you to formulate a request that may be handled at less cost. The best way we can help you is to ask you to consider narrowing down your request to focus more clearly on the precise information you are seeking. We suggest that you limit your request to specific responses or specific questions or areas of interest within the consultation.

Please note that we will handle your modified request as a new request. The 20-workingday timescale for responding to requests will therefore commence from the date that we receive the modified request. We also note that you do have two other information requests recently submitted to Defra that are currently being processed.

We attach an annex giving contact details should you be unhappy with the service you have received.

If you have any queries about this letter please contact me.

Yours sincerely

Guy Mawhinney
Information Rights Team
InformationRequests@defra.gov.uk

Annex

Complaints

If you are unhappy with the service you have received in relation to your request you may make a complaint or appeal against our decision under section 17(7) of the FOIA or under regulation 11 of the EIRs, as applicable, within 40 working days of the date of this letter. Please write to Andrew Mobsby, Head of Information Rights via email at InformationRequests@defra.gov.uk and he will arrange for an internal review of your case. Details of Defra's complaints procedure are on our website.

If you are not content with the outcome of the internal review, section 50 of the FOIA and regulation 18 of the EIRs gives you the right to apply directly to the Information Commissioner's Office (ICO) for a decision. Please note that generally the ICO cannot make a decision unless you have first exhausted Defra's own complaints procedure.

The ICO can be contacted using the following link:

<https://ico.org.uk/make-a-complaint/official-information-concerns-report/official-information-concern/>

Appendix4 A.2 – EIR2022/01226

EIR2022/01226_response.pdf – Defra response detailing the information sent



Alice Stuart
By email: Alice.Stuart@uea.ac.uk

Our ref: EIR2022/01226
11 February 2022

Dear Alice Stuart,

REQUEST FOR INFORMATION: Responses to the 2018-19 Defra Consultation on Biodiversity Net Gain (BNG)

Thank you for your request for information of 18 January 2022 about responses to the 2018-19 Defra Biodiversity Net Gain consultation. We have handled your request under the Environmental Information Regulations 2004 (EIRs).

The EIRs apply to requests for environmental information, which is a broad category of information defined in regulation 2 of the EIRs. Public authorities are required to handle requests for environmental information under the EIRs. They give similar access rights to the Freedom of Information Act 2000 (FOIA).

Your information request and our response are set out below.

"I would like to make a Freedom of Information request to access electronic copies of some of the responses to the DEFRA consultation on net gain held from 2nd Dec 2018 to 10th Feb 2019.

Detailed description of the information I want: Full electronic copies of all responses to the DEFRA consultation on net gain held from 2nd Dec 2018 to 10th Feb 2019 where respondents stated their organisation as being "none, I am responding as an individual". This differs to my previous request in that it is only a subset of responses, as opposed to all of them. This should be approximately 61 responses (13% of the 470 responses) which, according to your previous calculations, will take approximately 15.25 hours (61 responses to check, with each taking 15 minutes)."

We enclose a copy of the information you requested:

- Annex C: Responses received to Defra's 2018-19 BNG consultation where the responder marked 'None, I am responding as an individual' to the question asking about what sector they work in or otherwise represent. This totals 61 responses in all and this is all this information extracted from the full responses and put into an Excel spreadsheet.
- Annex D: response 61
- Annex E: response 62

Please note that Annexes D and E were emailed directly to Defra, so were not captured in the spreadsheet.

Some of the information in Annex C, specifically cell 30 D of the spreadsheet is being withheld as it falls under the exception in regulation 12(5)(d) of the EIRs, which provides for the exception from disclosure if this would adversely affect the confidentiality of a public authority's proceedings where the confidentiality arises from statute or common law. In applying this exception, we have had to balance the public interest in withholding the information against the public interest in disclosure. In considering this exception we have also applied a presumption in favour of disclosure, as required by regulation 12(2) of the EIRs.

We recognise there is a public interest in the disclosure of information relating to the views of stakeholders on the 2018-19 Defra Biodiversity Net Gain consultation. However, it is also important that Defra can carry out its formal policy making processes in confidence. Defra carries out consultations in order to have free and frank conversations with stakeholders as part of its policy making processes, and the preservation of confidentiality is necessary to allow these processes to continue. We consider that the confidentiality arises from the common law expectation that this information is kept confidential. As this has created an expressed expectation of confidentiality and, combined with the necessary quality of confidence of the information, it means that Defra has a duty of confidence in relation to these proceedings.

In addition, all personal information has been withheld under regulations 12(3) and 13(1) and (2A) of the EIRs as it constitutes personal data relating to persons other than you. These regulations exempt personal information from disclosure if that information relates to someone other than the applicant, and if disclosure of that information would breach any of the data protection principles in Article 5(1) of the General Data Protection Regulation (GDPR).

We consider that disclosure of this information is likely to breach the first data protection principle, which provides that personal data must be processed lawfully, fairly, and in a transparent manner. Disclosure would not constitute 'fair' processing of the personal data because the information relates to third parties who would not reasonably have expected their names to be made public.

Information disclosed in response to this EIRs request is releasable to the public. In keeping with the spirit and effect of the EIRs and the government's Transparency Agenda, this letter and the information disclosed to you may be placed on [GOV.UK](#), together with any related information that will provide a key to its wider context. No information identifying you will be placed on the GOV.UK website.

We attach Annex A, explaining the copyright that applies to the information being released to you, and Annex B giving contact details should you be unhappy with the service you have received.

If you have any queries about this letter please contact me.

Yours sincerely

Guy Mawhinney
Information Rights Team
InformationRequests@defra.gov.uk

Annex A

Copyright

The information supplied to you continues to be protected by copyright. You are free to use it for your own purposes, including for private study and non-commercial research, and for any other purpose authorised by an exception in current copyright law. Documents (except photographs or logos) can be also used in the UK without requiring permission for the purposes of news reporting. Any other re-use, for example commercial publication, would require the permission of the copyright holder.

Most documents produced by Defra will be protected by Crown Copyright. Most Crown copyright information can be re-used under the [Open Government Licence](#). For information about the OGL and about re-using Crown Copyright information please see [The National Archives website](#).

Copyright in other documents may rest with a third party. For information about obtaining permission from a third party see the [Intellectual Property Office's website](#).

Annex B

Complaints

If you are unhappy with the service you have received in relation to your request you may make a complaint or appeal against our decision under section 17(7) of the FOIA or under regulation 11 of the EIRs, as applicable, within 40 working days of the date of this letter. Please write to Andrew Mobsby, Head of Information Rights via email at InformationRequests@defra.gov.uk and he will arrange for an internal review of your case. Details of Defra's complaints procedure are on our website.

If you are not content with the outcome of the internal review, section 50 of the FOIA and regulation 18 of the EIRs gives you the right to apply directly to the Information Commissioner's Office (ICO) for a decision. Please note that generally the ICO cannot make a decision unless you have first exhausted Defra's own complaints procedure.

The ICO can be contacted using the following link:

<https://ico.org.uk/make-a-complaint/official-information-concerns-report/official-information-concern/>

4B – Summary of responses analysed

Table 4B.1: Organisational responses to the 2018-19 Defra consultation on Net Gain included within this analysis, with links where the responses are still available online.

Organisation	Sector	Link (Accessed 9th Jan 2024)
Ancient Tree Forum	Conservation Organisation	https://web.archive.org/web/20240617130241/https://www.ancienttreeforum.org.uk/wp-content/uploads/2019/03/ATF-response-Defra-Net-Gain.pdf
Anglian Water	Development industry	https://www.anglianwater.co.uk/SysSiteAssets/household/about-us/public-affairs-2019/defra---biodiversity-net-gain-consultation-response---february.pdf
Association of Environmental Records Centres (ALERC)	Professional body or association	http://www.alerc.org.uk/uploads/7/6/3/763190/defra_net_gain_consultation_-_aler_c_response.pdf
Bat Conservation Trust	Conservation Organisation	https://web.archive.org/web/20220413105217/https://cdn.bats.org.uk/uploads/pdf/Our%20Work/BCT-response-Biod-NetGain-2019-FULL.pdf
British Ecological Society	Professional body or association	https://www.cabidigitallibrary.org/doi/pdf/10.5555/20210117561
Chartered Institute of Ecology and Environmental	Professional body or association	https://web.archive.org/web/20231003135049/https://cieem.net/wp-content/uploads/2019/02/CIEEM-Net-Gain-consultation-response-Feb2019-FINAL.pdf

Management (CIEEM)		
Chartered Institution of Water and Environmental Management (CIWEM)	Professional body or association	https://web.archive.org/web/20240721194839/https://www.ciwem.org/assets/pdf/assets/uploads/CIWEM_Net_Gain_Consultation_Response.pdf
Campaign to Protect Rural England (CPRE) Sussex	Conservation Organisation	https://web.archive.org/web/20230804112203/https://www.cpresussex.org.uk/wp-content/uploads/sites/16/2020/04/Net-gain-response.pdf
Devon Local Nature Partnership (LNP)	Ecological or other environmental consultancy	https://web.archive.org/web/20240714124752/https://www.devonlnp.org.uk/our-work/building-with-nature/biodiversity-net-gain/
Energy UK	Other	https://web.archive.org/web/20220624220930/https://www.energy-uk.org.uk/publication.html?task=file.download&id=7028
Environmental Industries Commission (EIC)	Other	https://web.archive.org/web/20231207174417/https://eic-uk.co.uk/media/qsincm31/biodiversity-net-gain-eic-response.pdf

Environmental Policy Forum	Professional body or association	https://www.the-ies.org/sites/default/files/policy/2019-02_efp_biodiversity_net_gain.pdf
Friends of the Lake District	Conservation Organisation	https://www.friendsofthelakedistrict.org.uk/Handlers/Download.ashx?IDMF=5a61ca1b-0f30-4e34-80cd-c7c27f859079
Hampshire Swifts	Conservation Organisation	https://web.archive.org/web/20240814143535/https://www.hampshireswifts.co.uk/_files/ugd/e556df_0b3ea247d3254d7b84549af689b807aa.pdf
Historic England	Conservation Organisation	https://web.archive.org/web/20220318045127/https://historicengland.org.uk/content/docs/consultations/response-biodiversity-net-gain-updating-planning-requirements-consultation-feb19/
Institute of Environmental Management and Assessment (IEMA)	Professional body or association	https://web.archive.org/web/20240924145845/https://www.iema.net/media/nzzbnmab/iema-response-to-the-defra-net-gain-consultation-feb-2019.pdf
Institution of Environmental Sciences (IES)	Conservation organisation	https://www.the-ies.org/sites/default/files/policy/2019-02_ies_biodiversity_net_gain.pdf
National Farmers' Union (NFU)	Professional body or association	No longer available, please email for a copy

National Parks England	Conservation organisation	No longer available, please email for a copy
Open Spaces Society	Conservation organisation	https://web.archive.org/web/20220419235240/https://www.oss.org.uk/wp-content/uploads/2019/04/Net-Gain-Consultation-Proposal.pdf
Royal Town Planning Institute (RTPI)	Professional body or association	https://web.archive.org/web/20240526175143/https://www.rtpi.org.uk/media/2674/biodiversity_netgain_feb2019.pdf
Surrey Wildlife Trust, and on behalf of Surrey Nature Partnership's Biodiversity Working Group	Conservation organisation	https://surreynaturepartnership.org/wp-content/uploads/2019/09/paper-a_defra-net-gain-consultation_final_snp_080219.pdf
UK Environmental Law Association (UKELA)	Professional body or association	https://web.archive.org/web/20220804024444/https://ukela.org/common/Uploaded%20files/33_o.pdf
UK Green Building Council (UKGBC)	Other	https://web.archive.org/web/20240405103517/https://ukgbc.org/wp-content/uploads/2019/02/DEFRA-Net-gain-consultation.pdf

The reported numbers of responses to the consultation divided by respondent type and their inclusion in this analysis are shown in Figure 1. Planning authorities were the most common respondent, although these have not been

included in this analysis for the reasons noted above. Individuals are disproportionately represented, due to being gathered by the ERI as opposed to convenience sampling. Conservation organisations and professional bodies were disproportionately represented in my sample of organisational responses, whereas the opposite is true for ecological or other environmental consultancies. A full breakdown of responses can be found in Supplementary Data Table S3.

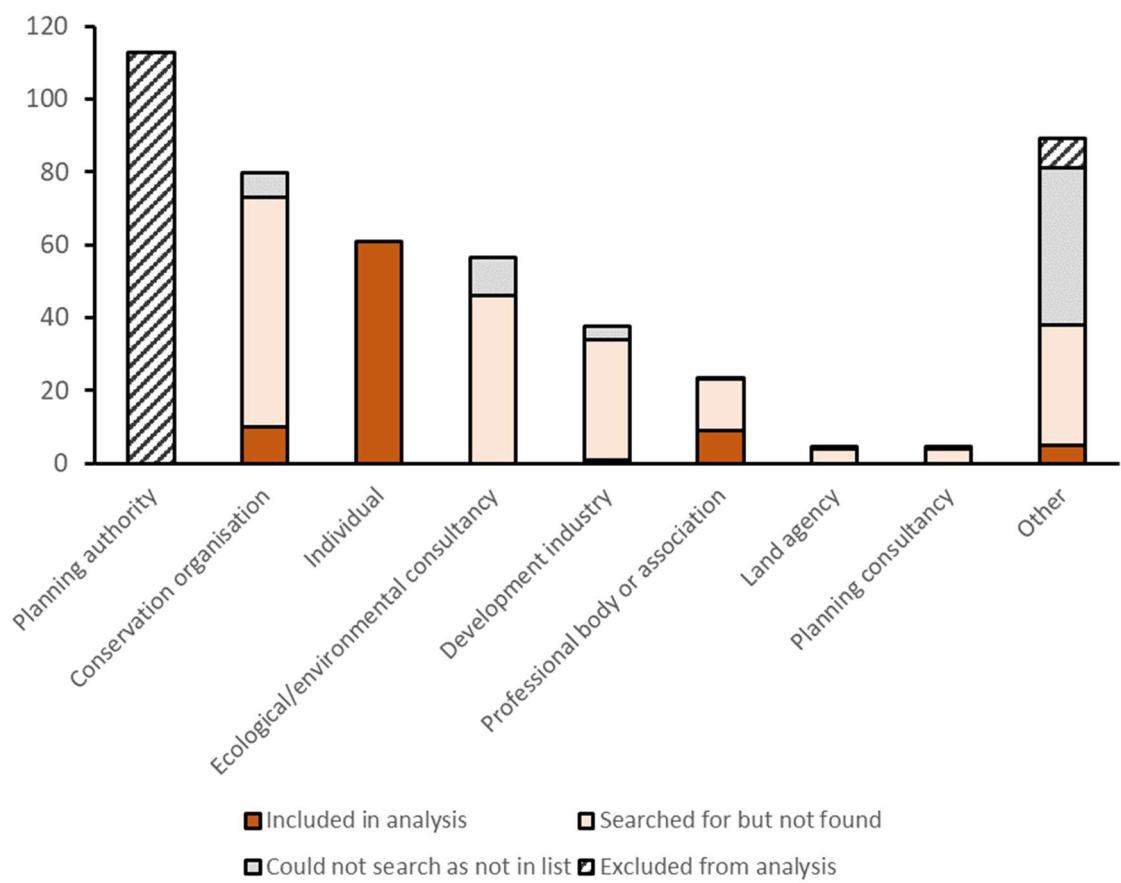


Figure 4B.1: Responses to the 2018 Defra consultation on Net Gain split by sector assigned by the authors. “Could not search as not in list” refers to where the number of organisations within a sector, as calculated using the percentage of responses coming from each sector, was greater than the number of organisations of that sector listed as respondents.

4C – Supporting Quotes

All organisational quotes are listed below split by the section they appear in. The quote used in text is shown italicised and underlined, with additional text surrounding the quote given for context.

For context on quotes from individual respondents, please search for the quote in EIR2022/01226_individual_responses_form.xlsx

4C.1 Concerns about assumptions underpinning BNG

4C.1.1 Replaceability of habitat

The principle that some pre-intervention habitats are effectively irreplaceable and that the metric process is not able to deliver net gain after their loss (*for example Ancient Semi-Natural Woodland and long-standing peat habitats*), is reiterated in the main consultation but needs to be reflected more clearly in the metric and to be prominent in its outputs. (British Ecological Society)

Pragmatically, there needs to be a simple tool to measure BNG. However, we must recognise the limitations of such a tool and use it accordingly. Notably, *irreplaceable habitats must be outside the scope of the metric*. (CIEEM)

Exclusion of irreplaceable habitats from being developed *as their loss cannot be mitigated or compensated for* (Friends of the Lake District)

Whilst the mitigation hierarchy is a form of guidance to developers when considering a development proposal, developers should be clearly reminded that developments can and may be refused for reasons of biodiversity interest. *There must be no weakening of the protections of designated sites or loss of irreplaceable habitats*. (Bat Conservation Trust)

IV.C.1.2 Ability to measure and compare biodiversity losses and gains

The metric should be accompanied by guidance on when it should be used in relation to patterns of weather and the seasons, as extended cold or dry periods

can have significant impacts on species and habitats. *There will inevitably be some subjectivity involved in the metric*, for example in assessing transitional areas between different habitat types. Guidance should emphasise the need to use suitably qualified ecologists and landscape architects (e.g. members of a chartered institute) and provide sufficient training to ensure that good data informs each assessment. (RTPI)

There is some concern that the metric disproportionately incentivises offsetting through easier to produce habitats. It is important that habitat diversity is maintained under the application of the metric. Again, we hope this will be resolved by the improvements made. Those applying the metric should be encouraged to sense check whether proposals are reasonable, taking into account the habitat lost and local, national and global biodiversity priorities. (CIWEM)

The Defra metric does not cover species and therefore we consider that it is not fit for this purpose. Biodiversity net gain should not be implemented until this has been rectified. When this is considered it is essential that the application of biodiversity net gain should only be undertaken within what is the functional range of species impacted. (Bat Conservation Trust)

4C.1.3 Creation of and approach to compensation

There is a risk that this policy will prevent habitat improvement outside of net gain delivery, with the policy itself acting as a deterrent to wider environmental improvements. Where Government policy encourages environmental improvements than those participating in such schemes should not be penalised by the metric. For example, should farmers be encouraged to plant forestry on green belt they should not subsequently be penalised through the biodiversity metric if they need to undertake development. Furthermore, normal farm business decisions around cropping on land should not be deemed intentional degradation of habitat. Farmers who are already delivering

good environmental outputs should not be penalised by the way the metric is applied. (NFU, bold in original)

Developer contributions through Section 106 and the Community Infrastructure Levy enable proposals to meet local and national planning policy. In doing so the development becomes acceptable and can be granted permission.//*Providing for biodiversity net gain and meeting these other obligations is not an either/or situation: both must continue to be delivered.*//Where payments to different contributions are under-threat, the viability assessment system can provide a mechanism to fully assess the impacts. Where this is undertaken, for example for a contaminated brownfield site, a transparent process is required.//Ultimately, however, If a proposal cannot deliver development in accordance with these requirements than local authorities should be able to refuse the development. (Friends of the Lake District)

There are uncertainties in ensuring implementation and, even if schemes are implemented perfectly, in achieving long-term success. Whilst it is acknowledged that some aspects of uncertainty are built into the metric, a target of 10% allows only a limited margin for error. Bearing in mind the circumstances in which the policy would be engaged it would be preferable to establish a high target, at least at the outset, but subject to future review in the light of experience. (UKELA)

Re-creating or restoring complex natural processes is inherently difficult and full of risk. We are unaware of any studies demonstrating either net-gain or no-net-loss from national offsetting or net-gain programmes, in contrast to numerous studies demonstrating net-losses of biodiversity^{6,7,8,9,10,11,12,13,14}. This is why it is so critical to adhere to the mitigation hierarchy, and why the first stage of impact avoidance is often considered to be the most important stage of the hierarchy^{15,16,17,18}. Furthermore, preventing harm in the first instance avoids the potential for negative social implications of removing nature from one location and replacing it elsewhere¹⁵. (British Ecological Society)

4C.2 Concerns about motivation for BNG

4C.2.1 Focus should be on nature, not development

A level playing field means that no developer can profit from not providing net gain. If this is a mandatory process that all development has to go through, then no one developer will be worse off than another. Net gain will just be another requirement that all developers need to provide at any development site for example utility connections, highways and complying with building standards.//In a country where so much biodiversity has been lost to development over the past 40 years, it is only right that something is done about it. (Friends of the Lake District)

The proposal to mandate BNG is strongly supported for most development but it must be underpinned by robust evidence, and its effectiveness should be regularly reviewed. The process is likely to increase the burden on LPAs and developers. However, this should not be taken as a reason not to pursue it, but rather it should be accepted and adequately recognised and resourced through the setting of appropriate tariffs and provision of adequate support to LPAs and Local Record Centres. It should also be recognised that, whilst there may be financial burdens to developers, there are other important corporate benefits, as evidenced through a number of developer testimonies and case studies. (CIEEM)

Energy UK welcomes the intention to use the Biodiversity Net Gain (BNG) principle as a tool to streamline decision-making in the planning process. We consider there to be potential for the BNG principle, if applied appropriately, to achieve this. There are, however, a number of areas where we would welcome further clarification or consideration to ensure that the BNG proposals deliver for the environment without placing additional burdens on the development industry. (Energy UK)

Net gain should not slow down the planning process for applicants or LPAs making planning decisions (NFU, full bullet point)

Simplicity is key for all involved in the new net gain process. Biodiversity unit calculation and net gain assessment should not be overly onerous for ecologists, whether in house or consultants. Developers should be able to locate, negotiate and invest in local offsetting in a low cost manner. For example, an online register of accredited offsetting providers could be established, together with interactive maps of green infrastructure requirements and the location of offsetting opportunities. (Anglian Water)

We understand that net biodiversity gain would be an additional cost to development. This would need to be assessed through whole plan viability assessments at the plan making stage and individual viability assessments at the application stage. The introduction of net gain in a phased manner would allow it to be integrated gradually into viability assessments so that it did not slow down the delivery of development. It should be recognised that sites with poor viability, such as rural exception sites providing 100% affordable housing, may not be able to meet the demands of this policy. (National Parks England)

4C.2.2 BNG must follow the mitigation hierarchy

That said, because the proposed Defra offsetting metric is necessarily simplistic and, therefore, will overlook the full biodiversity value of a site. Biodiversity net gain will only be successful with the proper application of the mitigation hierarchy and strong protection of non-designated sites. (Anglian Water)

Approaches to delivering net gain: We are concerned that there seems to be an acceptance (pg23) that irreplaceable habitats may be damaged in development activities. Although the document talks about 'last resort' compensation schemes, there needs to be stronger protection for certain habitats. We do not want a regime that allows serious environmental damage as long as compensation is paid. The process needs to consider the impact on peripheral wildlife species which may be dependent on the land in question, such as the

importance of hunting habitat for mammals, birds of prey etc. Small, isolated areas of protection are not self-sustainable. (CPRE Sussex)

Buying and selling biodiversity on a market should not be easily facilitated or normalised. It is therefore key that any market system is the absolute last resort, after genuinely and meaningfully embedding the mitigation hierarchy into the planning system. (Friends of the Lake District)

4C.2.3 Nature should not be an economic opportunity

Relying on a market -based system where price tags are put on nature before being turned into 'units' to be traded as a commodity on markets ignores that each component of biodiversity is unique. Due to its complexity cannot be truly replaced. (Friends of the Lake District)

The government should put in place mechanisms that support the development of a biodiversity offsetting market to facilitate the procurement of offsets as and when they are needed (Anglian Water, full bullet point)

4C.3 Conflict regarding what BNG should prioritise

4C.3.1 Pragmatism vs comprehensiveness

The planning process should be no more burdensome or expensive than is necessary, but it should be as strenuous and exhaustive as required to safeguard those things which have been identified as public benefits of particular value, especially if they are irreplaceable. Applicants, their advisors and planning authorities need accurate, comprehensive and reliable data generally, and locally, for speedy identification of unsuitable sites, or those with high value constraints, e.g. veteran trees. This can never be complete or fully up to date, so reliance also has to be on those doing pre-application surveys (ecologists and arboriculturists), to correctly identify the features of a habitat type and correctly identify veteran and ancient trees, in addition to any protected species that they may be associated with. (Ancient Tree Forum).

Our main reservation in supporting use of the Defra biodiversity metric is that the biological diversity of a site cannot fully be represented in a single value and encouraging comparison of single values to reduce the time it takes to process planning applications risks the loss of distinct and important habitats in favour of other habitats of deemed equal value rather than actual equal value.

(CIWEM)

The 2012 metric was misleading and undervalued habitats, species and their place in the landscape. The new metric would need to be able to articulate losses and gains down to a species level, not just present a net change in biodiversity. This oversimplification will undervalue habitats and species, the delicate balance of ecosystems and subsequently the ecosystem services they provide. Quantity is a large factor in the metric and does not replace the quality of biodiversity that could be lost. (Friends of the Lake District)

It should be acknowledged that introducing this system and a new requirement for net gain is likely to increase the burden on local authorities and developers, and unlikely to reduce the amount of survey effort required in the short term. It is essential that the Defra metric and associated requirements are easy to apply and interpret, and that sufficient resources and support is provided through finance, training and guidance to local authorities. This must address the complexity of incorporating BNG into assessments of viability at plan-making stage, the challenges with monitoring and enforcement, and the need for sufficient access to professional ecological expertise as described in Q2. There is precedent for this when central resourcing was provided to support the establishment of Lead Local Flood Authorities. (RTPI)

Pragmatically, there needs to be a simple tool to measure BNG. However, we must recognise the limitations of such a tool and use it accordingly. Notably, irreplaceable habitats must be outside the scope of the metric. (CIEEM)

Most of our Taskforce support 10%, although there minority had the view it is too high and could be a point of contention with developers. Regardless, the

level of increase should be subject to review after a period. One concern was that the number seemed to be arbitrary – further explanation in the document of the method undertaken to decide upon 10% may be useful. The proposed OEP could have a role in scrutinising the policy in general, and the suitability of the 10% target. (EIC)

This duration period must reflect the biodiversity priorities and should be in perpetuity. Otherwise there will be a rolling programme of losses of previously secured sites with a long term severe risk of ongoing net loss. (Bat Conservation Trust)

Fixed terms of 25-50 years may be far easier to agree than longer terms or agreements for management in perpetuity. Whilst 25-50 years may not seem like a lengthy period in the context of biodiversity conservation (particularly given the length of time some habitats take to establish), *often once land use has existed for such a period it becomes entrenched and endures.* As such the land manager may well be open to proposals to continue to the agreement on a yearly basis. (CIWEM)

The minimum duration should be 30 years. This should be long enough for habitats to have developed to such a state that they are delivering the required benefit, but short enough to help stimulate a properly working offsetting market. (Anglian Water)

4C.3.2 Access vs disturbance

It is vital that biodiversity net gain includes environmental improvements for public health and well-being, as well as benefits to landscape and climate change. New developments must be designed to include provision of open space with long-term maintenance arrangements, together with active travel routes as an integrated part of the original design of a new development. Such provision would help to ensure better outcomes for both people and nature.

The social aspects of net gain must be addressed to ensure the people factor of biodiversity is adequately considered. Biodiversity net gain could provide much

needed money to invest in local green spaces. The revised National Planning Policy Framework 2018 (NPPF) does encourage wider environmental net gain and includes the mitigation hierarchy but in general the planning system is failing to help to enhance the environment and the Defra biodiversity offsetting pilot had mixed results. (Open Spaces Society)

Application of biodiversity net gain should only be undertaken at the on-site or local level. This would be in keeping with ensuring that there is a community benefit to local people so that people have access to natural green space, they do not lose their biodiversity and potentially would see the benefits delivered by biodiversity net gain. (Bat Conservation Trust)

It should be made clear that wherever habitat compensation/net gain is being delivered that it must be in the context of ensuring that meaningful biodiversity net gain is not confused with providing recreational green space. Where green space is required as part of Alternative Natural Greenspace, this needs to be additional to a scheme and not on the back of biodiversity requirements as the two often do not sit well together. Undue disturbance of a habitat can significantly reduce its function and overall value to wildlife. This is particularly important where specific species requirements need to be considered as part of an overall mitigation scheme. (National Parks England)

Members are not supportive of domestic gardens being included in the metric as householders are free to manage that space to meet their own objectives which may not align with the needs of biodiversity. Areas created to meet biodiversity net gain requirements must be managed for biodiversity benefit not to meet recreation needs which would be considered under a wider environmental net gain approach. (CIWEM)

We question the assumption that biodiversity units should always be delivered on site as a first option. In many cases future urban effects will cause degradation of new habitats and it would be far better ecologically to create some habitats elsewhere (whilst ensuring that landscape connectivity is

maintained around the site as required e.g. for bats, dormice etc). Access to wildlife is important but multifunctional sites should only be used as part of compensation and net gain where this is appropriate ecologically. (Devon LNP)

4C.3.3 Local needs vs national strategy

The wording of the consultation fails to distinguish between the compensatory habitat/offsets, and habitats that could be created/enhanced to meet the additional number of biodiversity units to make it a net gain. This is an important difference. In order to avoid biodiversity deserts any biodiversity loss must be fully compensated onsite, or locally as a last resort. If this cannot be achieved the development should be refused. Once no net loss has been achieved, onsite and local opportunities for net gain should continue to be explored, but the definition of 'local' could be slightly broader. This would need to be well-defined. (Friends of the Lake District)

Tariffs should be collected as part of the planning system and there is no need for new system to be collected.//Money should be spent locally as it is closer to the people affected by development, and many of the costs are incurred locally. (ALERC)

We believe that it is only fair that communities should share in the benefits of development. If revenue is collected nationally, it is unclear how local communities will benefit and be able to influence decision-making. (Anglian Water)

BCT does not believe that tariffs should be collected and spent nationally. This undermines the principles of local biodiversity and communities. It runs the risk of creating biodiversity hot spots. It would certainly see net loss for species conservation. (Bat Conservation Trust)

We question the assumption that biodiversity units should always be delivered on site as a first option. In many cases future urban effects will cause degradation of new habitats and it would be far better ecologically to create

some habitats elsewhere (whilst ensuring that landscape connectivity is maintained around the site as required e.g. for bats, dormice etc). Access to wildlife is important but multifunctional sites should only be used as part of compensation and net gain where this is appropriate ecologically. (Devon LNP)

Biodiversity is a crucial component of natural capital, particularly within agricultural landscapes⁴². Despite this, England has suffered from considerable human-induced habitat loss for wild species⁴³, with this being perhaps the biggest driver of biodiversity decline¹. Net-gain delivery should seek to prioritise habitat restoration or creation in locations that increase ecological connectivity and ecosystem resilience, in line with the Lawton principles of Bigger, Better, More, and Joined (BBMJ)⁴³, and a broad scientific recognition that the maintenance and restoration of connectivity at landscape scales is crucial for biodiversity conservation^{3,44,45,46,47}. Improving ecological connectivity is complex, but there is an increasing body of literature^{44,48,49,50} that can help guide strategies and prioritisation for doing so. (British Ecological Society)

A strategic approach to tariff payments could work effectively for dense urban areas, where much of the development will be on small brownfield sites. It could also help to address social inequalities by targeting spend on areas which have a green space deficiency and/or high levels of deprivation, but where little new development is expected. A strategic approach could also prioritise spend according to an environment strategy which addresses access to green space by public and active transport, and moves away from defining local compensation according to political and administrative boundaries, or crow-flies proximity. For example, it could assist users of the Defra metric to adjust weightings to account for compensation in a green space which is close to the site in question, but located across a busy road which limits access. (RTPI)

A Biodiversity Net Gain scheme must be led by a national plan as part of a wider strategic view of spatial planning for the delivery of nature improvements and natural capital. (Ancient Tree Forum, full bullet)

It is important not to unwittingly facilitate the destruction of local habitats through valuing national scale networks more highly. Local habitat networks provide ecological stepping stones within the wider landscape and should be protected as far as possible. Thus, we are fully supportive of the mitigation hierarchy. (CIWEM)

4C.3.4 Flexibility vs standardisation

Some LPAs already using the Defra metric have taken positive decisions to adjust the metric to reflect local priorities. *New rules should act as a minimum and allow flexibility for reasonable adjustments.* (CIWEM)

“ensur[e] that the delivery of net gain in biodiversity is characteristic of the local area and makes a meaningful contribution to the landscape” (Local Nature Partnerships)

A *simple metric with few opportunities for subjectivity / argument.* Unless there is a very good reason to keep the condition score within the metric as is we suggest that this is standardised (see Q.11) in site assessments – discussions over condition scoring is already placing a burden on LPAs. (Devon LNP)

A standardised approach is a useful step in developing a simpler, more efficient assessment process. However, in improving efficiency we must not sacrifice functionality; assessments must be fit for the purpose of delivering biodiversity net gain. Reliance on remotely collected data will not be sufficient in all cases and should be supported by expert knowledge. (CIWEM)

One objective of the proposals is to simplify the whole planning process, whilst integrating biodiversity net gain. The easiest way to ensure simplicity is to enforce a consistent approach across the board so developers *know exactly what is required without a complex system of exemptions or exclusions.* (Hampshire Swifts)

Standardisation of process across different localities.

This means that developers entering the planning system in any part of the country should know what evidence they need to provide or access and in what format. Data standards ensure data can be collected and shared in same way for all projects. (ALERC)

4C.4 Variable trust in actors involved in BNG

4C.4.1 Trust in developers

No organisational quotes used.

4C.4.2 Trust in local authorities

There are significant concerns about whether local authorities have the skills, knowledge, resources and capacity to support and deliver mandatory biodiversity net gain. IEMA is not convinced that the scheme can operate robustly without significant additional support, guidance and access to professional ecological and environmental advice. Central Government should not expect to pass on the entire burden of delivering mandatory BNG to local authorities and developers. (IEMA)

The capacity and resources of Local Authorities to conduct or verify robust ecological assessments are a significant concern. This could be met by central government funding, or alternatively, where local expertise and resources are lacking, bodies such as Natural England may be able to take a greater role in providing experts for conducting assessments. Natural England would be well placed in this role, given its pre-existing involvements with developments and environmental assessments. This would minimise the additional funding burden, with biodiversity assessments matching pre-existing obligations as far as possible. However, Natural England currently faces its own capacity challenges which would need to be addressed.” (UKGBC)

This question [How could biodiversity assessments be made more robust without adding to burdens for developers or planning authorities?] approaches the issue from the wrong angle. Robust biodiversity assessments are essential if

net-gain is to become the default position. If this requires greater involvement from planning authorities then this needs to be properly funded, either from developer contributions or from government sources. Local authorities should be acting to protect the interests of the public, not inadvertently facilitating the activities of developers by being inadequately funded to properly manage the planning process. (Hampshire Swifts)

The metric does need to allow for important local features and local designations. We acknowledge the importance of having one system of measurement, in the interests of transparency, but it needs to be flexible enough to take account of significant local variations and features, especially for smaller scale application. We stress the importance of having independent assessment of baseline data and application of variations for local features, rather than leaving this to developers and planning authorities, who may well have a vested interest. Establishing higher levels of protection for local sites would be helpful in this process. (CPRE Sussex)

In designing the governance structure for the tariff, consideration must be given to any negative impacts and perverse incentives accruing as a result of external pressures on the governance body. For example, local authority housing target pressures must not unduly encourage recourse to the tariff at the expense of the mitigation hierarchy. (UKGBC)

4C.4.3 Trust in Natural England

This highlights a major concern about the whole proposal. It is not acceptable for this aspect to be a ‘cosy agreement’ between developers and planning authorities. Neither of these parties may be in the best position to take decisions on how to spend the money. As already stated in Q 31 and elsewhere, we need a wider partnership approach to the whole process. This would be based on a formal agreement between these parties plus local and national environmental bodies who may be in a better position to identify the priorities. It could also link to the role of Local Nature Partnerships, albeit in a more

slimmed down version. This would help such decisions to be accepted as genuinely in the interests of the environment, and not just an agreement between parties with vested interests i.e. developers who want to develop as cheaply as possible and planning authorities who need to meet often unrealistic housing targets. We are concerned by national press and local experience that Natural England is underfunded and no longer impartial and often not meeting its duties in terms of protecting the natural environment. (CPRE Sussex)

4C.4.4 Trust in wildlife charities

With such a low tariff rate, would-be providers who needed to buy land would NOT be able to compete with the tariff, or with providers who already hold land whose habitat value they are willing to raise for a price. This will make it more difficult for conservation bodies (e.g. Wildlife Trusts) to become providers as their existing land holdings will already be of high habitat value and the cost of land of low habitat value is significantly higher than the tariff. This is particularly unfortunate as such organisations are likely to be amongst the best at creating, enhancing and managing habitats, and the most keen to manage for biodiversity in perpetuity. (Devon LNP)

4C.5 Need for accountability structures

4C.5.1 External accountability structures

Standardisation of process across different localities.

This means that developers entering the planning system in any part of the country should know what evidence they need to provide or access and in what format. Data standards ensure data can be collected and shared in same way for all projects. (ALERCS)

The contracts need to be clear how success is measured and, where there are potential failures, how these will be addressed. (NFU)

Biodiversity net gain should be mandatory because in practice many developers opted out of net gain, as illustrated in the mixed results of the Defra biodiversity offsetting pilot. Developers need certainty to plan development. Measurable targets enable businesses to report on progress towards achieving them, as they do for other environmental issues, in for instance a sustainability action plan. It is essential to gain a better understanding of the bigger role biodiversity has in creating healthy neighbourhoods for future generations and to address climate change impacts. (Open Spaces Society)

The duration of maintenance should be as long as possible. Net gains need to be recorded and mapped to ensure that sites are maintained for the prescribed duration. (CIEEM)

Random sampling of net gain sites is unlikely to be enough. Sampling will need to be systematic and risk-based, explicitly designed to allow regulators an overview of the sector (one of the main recommendations for land use regulators from the Dame Glenys Stacey Review). All sites and their targets could be published on a public register to allow stakeholders to check their performance. (British Ecological Society)

The introduction of conservation covenants could play a key role in making the theory of biodiversity net gain a practical option primarily by providing a mechanism to secure the compensation site over the long term. The covenant process could also introduce a clear mechanism to define appropriate land management, a structure to achieve financial support and a monitoring and enforcement procedure that could pick up problems at an early stage. We urge DEFRA to hasten its work on conservation covenants as they are vital to the proper implementation of the net gain principle. (Ancient Tree Forum)

Effective monitoring will be vital to ensuring that conservation covenants are working. This will require appropriate funding to ensure that monitoring can take place and for appropriate enforcement procedures if required. This funding should be part of the capitalisation of the conservation credit value

paid by the developer.//Additionally, the covenant will need to be monitored *by an appropriately independent body with the necessary legal/financial powers to enforce compliance.*//Covenants must be publicly available to ensure that the information and requirements of the covenant are transparent. (CIEEM)

Ensuring that LPAs have the necessary funding to implement – and more importantly, monitor and enforce – BNG. This could be provided by brokers paying the LPAs if a market can be created through mandating BNG. (CIEEM)

In ensuring that schemes deliver the contracted benefit, monitoring and enforcement will be paramount. Overall this responsibility should fall to local planning authorities. Brokers could lessen the enforcement requirement by undertaking monitoring and enforcement of their schemes and reporting to LPAs. As there is no excess capacity in Local Government to take on additional monitoring and enforcement, *provision should be made in the legislation for local authorities to recover costs through planning charges.* (CIWEM)

Net gain should be part of a regulatory framework that delivers scientifically valid evaluation and monitoring. Greater knowledge is required within ecologists /arboriculturists to correctly identify and value ancient and veteran trees and the wider habitats of which they are a part, e.g. wood pasture other priority habitats. Local planning authorities also often lack the ecological and tree expertise and resources to assess and implement this approach in a way that will secure long term biodiversity gains. *A capped amount of all tariffs received, should be used to ensure the proper assessment, implementation and monitoring of all projects.* (Ancient Tree Forum)

4C.5.2 Accountability during implementation

We support the potential for accreditation of undertakers of habitat assessment, particularly through professional bodies like the Chartered Institute of Ecology and Environmental Management (CIEEM). CIEEM brings with it requirements for continuing professional development, following codes of practice, and has whistleblowing policies. The ability of professional bodies

to hold their members to account is key to ensuring BNG potential is met.// For the same reasons, we also encourage offsetting providers to be able to be accredited so they can demonstrate their professional practice and provide assurance to developers. (Anglian Water)

We support the use of a trust or endowment approach as it would be imprudent to rely on the developer to remain in business and able to pay for the necessary management of the offset site without a form of insurance or secured funding for the duration of the offset. A further consideration would be to utilise established, credible conservation partners to create and conserve habitats in perpetuity (for example RSPB, The Wildlife Trusts and the Woodland Trust). (IEMA)

Accreditation and enforcement are needed to safeguard against poor practices and ensure a market for quality, well managed, biodiversity units develops. Trust in the market will support its growth. (CIWEM)

Appendix 5 Chapter 6 Supporting Information

5A – Full questionnaire

A pdf copy of the full questionnaire is available on figshare
(<https://figshare.com/s/6b3afc6f95c704f1f8cf>)

The questionnaire is also included below.

Public opinions of the Norwich Western Link



A research questionnaire aiming to get an overview of people's opinions on the Norwich Western Link and its impacts on biodiversity and what is likely to inform them. It is being undertaken as part of a PhD on understanding the social acceptance of a conservation-planning policy.

* Required

Participant Information

Title of Study: Public opinions of the Norwich Western Link's approach to biodiversity

Department: School of Environmental Sciences

Name and Contact Details of the Researcher(s): Alice Stuart, School of Environmental Sciences, The University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, United Kingdom

alice.stuart@uea.ac.uk

Thank you for your interest in this research. Participation is entirely voluntary and choosing not to take part will not disadvantage you in any way. Before you decide to take part, it is important to make sure you understand why the research is being done and what it will involve. Please read through the following information carefully and discuss it with others if you wish. If anything is not clear, or you would like more information, please contact us using the details above.

1

What is the project's purpose?

The aim of this questionnaire is to get an overview of people's opinions on the Norwich Western Link and its impacts on biodiversity and what is likely to inform them. It is being undertaken as part of a PhD on understanding the social acceptance of a conservation-planning policy. We are looking for people over the age of 16 with a range of relationships to and views on the Norwich Western Link. You need not have prior knowledge of the Norwich Western Link. Information will be provided within the questionnaire where it is required to supplement your existing knowledge.

2

Do I have to take part?

Participation is entirely voluntary. If you decide to take part, you will be asked to complete a consent form stating that you understand and are happy with how your data will be used. Even after completing this form, you can withdraw your consent up until the point you submit the questionnaire without giving a reason. This can be done by navigating away from the questionnaire and not submitting your results. As participation is anonymous it will not be possible for us to withdraw your data once you have returned your questionnaire unless you have provided your email in the final question. If you have provided your email, you will be able to withdraw your answers without giving a reason by emailing the principal researcher, Alice Stuart, using the email alice.stuart@uea.ac.uk.

3

What will happen if I take part?

Following a short consent form you will be asked to complete an online questionnaire containing 61 short questions and statements, most of which are multiple choice, will take about 15-25 minutes to answer depending on how much detail you include in your answers. The questionnaire is entirely online.

At the end of the questionnaire is an opportunity to provide contact details so that we can contact you about this research in the future. If you do provide contact details, you may be invited to take part in an online interview to discuss your views further. Participation in this interview is entirely voluntary.

There are no immediate benefits to yourself gained by participating in this research. However, we intend for this research to help organisations improve their approaches to biodiversity management. Participation may increase your awareness and knowledge about the Norwich Western Link. We do not predict that you will experience any discomforts, disadvantages and/or risks for taking part. None of the data you provide is personally identifiable (see 9. below) and all questions have the option not to give the information

All data will be collected and stored in accordance with the Data Protection Act 2018 and the General Data Protection Regulation.

What if something goes wrong?

If something does not work, requires further explanation, or you would like to raise a complaint about this research, please contact the Principal Researcher, Alice Stuart, at alice.stuart@uea.ac.uk

If this does not adequately address your concerns, you can contact the UEA School of Environmental Sciences Ethics Officer, Dr Casper Ebbengaard (c.ebbengaard@uea.ac.uk), or the Head of the School of Environmental Sciences, Professor Ian Renfrew (i.renfrew@uea.ac.uk)

Will my taking part in this project be kept confidential?

All the data collected during this research will be kept strictly confidential. The data will be anonymised such that you will not be able to be identified in any ensuing reports or publications. Confidentiality will be respected subject to legal constraints and professional guidelines. Where we do collect contact details (see 5. above) these will be stored separately to the research data and only kept for as long as is needed to contact you about this research.

What will happen to the results of the research project?

The results of this research are likely to be disseminated in standard academic outlets and may also be disseminated via general interest magazines / newspapers / journals. You will not be identifiable in any report or publication. If you wish to be sent the results of this research personally, please contact the Principal Researcher, Alice Stuart, at alice.stuart@uea.ac.uk

Deception

This study does not include any deception, however extra information about the project will be revealed partway through the questionnaire, this will be explained at the end of the questionnaire. If at any point you become uncomfortable, you can withdraw from the study at any time prior to submitting your answers.

Data Protection Privacy Notice

The data controller for this project will be the University of East Anglia (UEA). The Data Protection Act 2018 and the UK General Data Protection Regulation (UK GDPR) give the University responsibilities in relation to how we handle personal information. Those who collect and use personal data on behalf of UEA must follow the data protection principles found in the UK GDPR and the University's Data Protection Policy (<https://my.uea.ac.uk/documents/20142/193428/Data+Protection+Policy+v4.0.pdf/b5d893d1-8207-6c07-6600-df3471524e527t=1600426137040>). As a data controller, the University is registered with the Information Commissioner's Office (ICO). Our registration number is Z8964916 and we are also listed on the ICO website (<https://ico.org.uk/ESDWebPages/Entry/Z8964916>).

Who is organising and funding the research?

This research is conducted as part of a PhD grant awarded by the National Environmental Research Council (NERC) in CASE partnership with Anglian Water Services. For further information on the project, please use the following contact details:

Alice Stuart
 School of Environmental Sciences, The University of East Anglia, Norwich Research Park, Norwich,
 NR4 7TJ, United Kingdom
alice.stuart@uea.ac.uk

Thank you for reading this information sheet and for considering taking part in this research study.

On the next page you will be given a consent form for participation in this research.

Consent

I volunteer to take part in this PhD research questionnaire. I understand that the research aims to collect data on people's views on the Norwich Western Link and its biodiversity impact. The data collected in this questionnaire will be used in a PhD thesis, potential publications based on the PhD thesis, and to expand the field of social acceptance of conservation-planning policies.

Principle researcher: Alice Stuart, alice.stuart@uea.ac.uk

11

I confirm I am aged 16 years or older *

12

I confirm that I have read and understood the Information Sheet provided to me for the above study/project, I have had the opportunity to ask questions via email and I am happy with any answers received. *

13

I understand that my participation is voluntary and that I am free to withdraw at any time before submitting the questionnaire, or after submitting where I have included contact details, without giving a reason. *

14

I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law. *

15

I understand that quotes from my responses may be used when writing up this study and that all quotes used will be anonymised *

16

I agree to take part in this study *

Knowledge of and Relationship to the Norwich Western Link

17

Where did you find out about this questionnaire? (tick the one that best applies) *

- A community Facebook group
- Leaflet through door
- An activist group
- Local council group
- Word of mouth
- Other

18

What is your relationship to the Norwich Western Link? (please select all that apply) *

- None
- Previously lived in area
- Local resident
- Non-local
- Local landowner
- Interested person
- Other

19

How much do you know about the Norwich Western Link? (Please tick the statement that best applies) *

- I am well informed
- I am somewhat informed
- I had heard of it prior to this questionnaire but don't know any details
- I had not heard of it prior to this questionnaire

Where are the main places you have got information about the Norwich Western Link? (Please tick up to three) *

Please select at most 3 options.

- Communications from the developers (e.g. town halls and consultations)
- News outlets (newspapers, tv, radio, etc.)
- Personal experience
- Interactions with (including attending) protests against the Norwich Western Link
- Other social media
- Word of mouth
- Facebook
- Twitter
- Material from a charity or environmental group
- Other

Impacts of the Norwich Western Link

21

What do you think the impacts of the Norwich Western Link will be on: *

** Biodiversity is the term that is used to describe the variety of all life on earth. It includes all species of animals and plants – and everything else that is alive on our planet.

*** Local is being used to refer to the people, nature and economy in close spatial proximity to the Norwich Western Link, as opposed to national which refers to the country as a whole

	Very negative	Somewhat negative	Neither positive nor negative	Somewhat positive	Very positive	Don't know
you personally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
the local community***	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
local nature***	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
the local economy***	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
biodiversity**	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
national nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
the national economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
the climate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22

What do you think the overall impact of the Norwich Western Link will be? *

- Very positive
- Somewhat positive
- Neither positive nor negative
- Somewhat negative
- Very negative

23

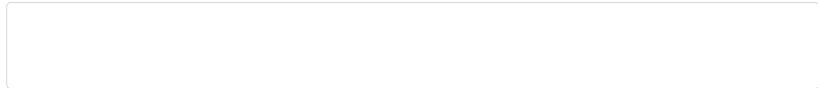
Do you think the impacts of the Norwich Western Link are acceptable? *

- Yes
- No
- Don't know

24

Please explain any impacts of the Norwich Western Link you think are unacceptable and why: *

If there is anything else you would like to add about the questions on this page, please use this space:

A large, empty rectangular box with a thin black border, designed for handwritten notes or additional responses.

Developer of the Norwich Western Link

26

Do you know who the developer of the Norwich Western Link is? *

Yes

No

27

Please write the name of the developer of the Norwich Western Link here: *

28

To your knowledge, are there plans in place to try to address the impact of the Norwich Western Link on biodiversity? *

Yes

No

Don't know

29

What do you think of the methods the Norwich Western Link will use to address its impact on biodiversity? *

Best practice

Good

Adequate

Poor

Worst practice

Don't know

30

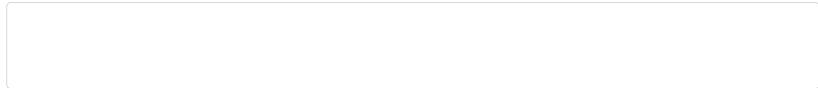
Do you trust the developers of the Norwich Western Link to successfully carry out their plans to address its impact on biodiversity? *

Yes

No

Other

If there is anything else you would like to add about the questions on this page, please use this space:

A large, empty rectangular box with a thin black border, designed for handwritten notes or additional responses.

Potential to act against the Norwich Western Link

32

Are you against the Norwich Western Link being built? *

- Yes
- No
- Don't know

33

Have you taken any action against the project? If so what action have you taken? (Please tick all that apply) *

- No action
- In person protests
- Signed a petition
- Talked negatively about the project to others
- Letter to MP or another politician
- Commented on planning application
- Other

34

Would you take action against the project in the future? If so what would you do? (Please tick all that apply) *

- No action
- In person protests
- Sign a petition
- Talk negatively about the project to others
- Letter to MP or another politician
- Comment on planning application
- Other

35

Is there anything stopping you from taking action?

Information about biodiversity net gain

36

An Overview of Biodiversity Net Gain

Biodiversity is the term that is used to describe the variety of all life on earth. It includes all species of animals and plants – and everything else that is alive on our planet.

Habitats are the places in which species live.

Biodiversity net gain is defined as “an approach to development that leaves biodiversity in a better state than before”. In England, biodiversity net gain works by measuring the value of habitats using a numeric metric. The metric values habitat based on its size, distinctiveness (similar to rarity), condition, and strategic importance for conservation in that area. The value of habitats before and after the development are calculated and compared and, if the predicted value after development is higher than the value before development, the development can claim it will achieve biodiversity net gain. This increase in value is achieved through creating and/or enhancing habitat. The created or enhanced habitats will often take a number of years to reach their predicted value and must be maintained for at least 30 years from creation.

Where the habitat lost is high distinctiveness, such as lowland mixed deciduous woodland, the created or enhanced habitat must be of the same type. For more common/abundant habitat types, such as most agricultural land, the replacement habitat may be of equal or higher distinctiveness. Habitats that are very high distinctiveness, for example ancient woodlands, are deemed ‘irreplaceable’ under biodiversity net gain and a project cannot claim overall net gain if such habitats are damaged.

37

Would you like to find out more about the metric used by the Norwich Western Link to measure biodiversity? (This information is not necessary to complete the rest of the questionnaire) *

Yes

No

38

The Biodiversity Metric

The metric is designed to measure biodiversity loss and gain in a consistent and robust way. It uses habitat as a proxy for wider biodiversity, with different habitat types scored according to their relative biodiversity value. This value is then adjusted depending on the condition and location of the habitat, to calculate ‘biodiversity units’ for a specific project, development, or area of compensation. After calculation, the metric will give the value of a habitat in “units”.

The **net biodiversity change** is the habitat value after development (any retained habitat that was there originally + newly created and/or enhanced habitat) minus the baseline habitat value before development:

$$\left(\text{Retained biodiversity units} + \text{Created biodiversity units} \right) - \text{Baseline biodiversity units} = \text{Change in biodiversity units}$$

39

Baseline Biodiversity Units:

The baseline unit calculation uses the **size of the development site** and three habitat features: **distinctiveness** (the relative scarcity of the habitat and its importance for nature conservation); **condition** (how good an example of the habitat type it is); and the **strategic significance** (how important the habitat is in that location). The baseline includes all habitat that will be impacted by the development, including land that will be used for compensation.

$$\text{Size of impacted habitat (ha)} \times \text{Distinctiveness} \times \text{Condition} \times \text{Strategic significance} = \text{Baseline biodiversity units}$$

Retained Biodiversity Units:

The amount of original habitat remaining after development, calculated using the same formula as baseline biodiversity units.

Created Biodiversity Units:

For habitat creation and enhancement, there are additional uncertainties and a risk of failure to create or improve the biodiversity unit value of a habitat. In the metric, these risks are accounted for using further multipliers: **difficulty** (the difficulty and uncertainty of successfully creating, restoring, or enhancing a habitat); **time to target condition** (accounts for the time lag between the negative impact on biodiversity and the compensation reaching the required quality); and **off-site risk** (to disincentivise habitat being provided a large distance from the habitat that has been damaged). As the risk multipliers are set to values less than or equal to 1, this will typically increase the size of the habitat required as compensation above the size of habitat lost or damaged.



General views on biodiversity net gain

42

How much of the information given about Biodiversity Net Gain in the previous section did you know prior to starting this questionnaire? *

- All of the information
- The majority of the information
- About half of the information
- Some of the information
- None of the information

43

Do you believe it is possible to create a net gain in biodiversity after a development causes biodiversity loss through the creation and enhancement of habitat? *

- Yes
- No
- Don't know
- Other

44

Do you believe it is possible to measure and compare the value of biodiversity in an area using a standardised numeric metric? *

- Yes
- No
- Don't know
- Other

45

Is there anything else that could be done that would, in your opinion, improve biodiversity net gain as an approach?

Additional information about the Norwich Western Link

46

General Information:

The Norwich Western Link (also known as the Wensum Link) is a proposed new section of dual carriageway that would connect the Broadland Northway (formerly known as the Northern Distributor Road) between the A1067 and the A47 in the west of Norwich. It has been proposed to reduce congestion and journey times, as well as to reduce 'rat running' through nearby villages. The proposed route for the Norwich Western Link is shown below[1]; the original proposed route is shown with a solid green line and the more recently added diversion over the river Wensum with a dotted green line.



Alt text: Map of the preferred route for the Norwich Western Link from the A47 near Herringham to Broadland Northway outside Taverham. A solid line shows the original route and a dotted line shows the diversion added to avoid the bat supercolony.

47

You will now be given additional information on the Norwich Western Link's approach to biodiversity. Would you prefer to be shown the shorter or more detailed version of the text? (This will not impact your ability to answer the rest of the questionnaire) *

- Shorter
- More detailed

Approach to biodiversity (shorter)

48

The Norwich Western Link is aiming to achieve biodiversity net gain for all applicable habitats. Biodiversity net gain is defined as "an approach to development that leaves biodiversity in a better state than before"[2]. This means that the Norwich Western Link will create and improve the habitat on, and potentially off, site so that the biodiversity unit value of most habitat types after the road is complete will be at least 10% greater than the pre-development value.

The Norwich Western Link is set to pass through multiple habitats, including some listed as principle importance in the UK. None of the woodland that is set to be lost meets the planning criterion for ancient woodland; however, twelve ancient / veteran trees and two important hedgerows are set to be removed and areas of ancient woodland may be degraded. As ancient trees and woodlands are deemed irreplaceable, they cannot be included within the biodiversity net gain strategy meaning the Norwich Western Link cannot claim overall biodiversity net gain, instead these habitats will be treated using separate strategies to help mitigate the impact of their loss. This is in line with the current good practice principles for biodiversity net gain[3].

The Norwich Western Link will also impact multiple species, including the protected Barbastelle bat. Species are not included in the biodiversity net gain calculation, but the created and enhanced habitat have been designed to benefit the impacted species and many have compensation requirements set by other policies. Original surveys found the original preferred route would directly impact the largest known colony of Barbastelle bats in the UK[4]. The route has been changed to minimise impact on the bats, contributing to an increase in costs from around £200m to around £250m[5]; despite this re-route, it is likely the road will still have some impact on the bat colony[5].

49

References: (not required to answer questions, click next below)

- [1] 'Bats Force Western Link Route Change - but Extra Cost Not yet Revealed', *Eastern Daily Press*, 2022 <<https://www.edp24.co.uk/news/local-council/20631895.bats-force-western-link-route-change---extra-cost-not-yet-revealed/>> [accessed 27 April 2023].
- [2] WSP and Norfolk County Council, *Norwich Western Link EIA Scoping Addendum*, July 2022 <<http://eplanning.norfolk.gov.uk/Document/Download?module=PLA&recordNumber=17796&planId=64468&imageId=1&isPlan=False&fileName=NWL%20Scoping%20Review%20Alignment%20Change%20July%202022.pdf>> [accessed 3 May 2023].
- [3] J Baker, R Hoskin, and T Butterworth, *Biodiversity Net Gain. Good Practice Principles for Development. A Practical Guide* (London: circa, 2019) <<https://cieem.net/wp-content/uploads/2019/02/C776a-Biodiversity-net-gain-Good-practice-principles-for-development-A-practical-guide-web.pdf>> [accessed 27 April 2023].
- [4] 'Fears NDR Western Link Could Wipe out "Largest Barbastelle Bat Colony in UK"', *Eastern Daily Press*, 2020 <<https://www.edp24.co.uk/news/local-council/20712580.fears-ndr-western-link-wipe-largest-barbastelle-bat-colony-uk/>> [accessed 28 April 2023].
- [5] Ashlea Hickin and George Thompson, 'Warnings Road Will Have a "devastating" Impact on Rare Bats despite Reroute', *NorfolkLive*, 2022 <<https://www.norfolklive.co.uk/news/norfolk-news/norwich-western-link-rare-bats-7261952>> [accessed 27 April 2023].

Approach to biodiversity (detailed)

50

The Norwich Western Link is aiming to achieve biodiversity net gain for all applicable habitats. Biodiversity net gain is defined as "an approach to development that leaves biodiversity in a better state than before" [2]. The Norwich Western Link will look to achieve a minimum of 10% biodiversity net gain, as measured by The Biodiversity Metric 3.1[3]. This means that the Norwich Western Link will create and improve the habitat on, and potentially off, site so that the biodiversity unit value of after the road is complete will be greater than the existing habitat. If a 10% increase in biodiversity unit value is not achieved on site, options for off-site delivery using either habitat banks, which create habitat so they can sell the units to developers, or bespoke agreements with landowners, in which the landowner would create compensatory habitat, will be investigated.

The Norwich Western Link will pass through areas of floodplain grazing marsh, lowland mixed deciduous woodland, and wet woodland; all of which are habitats of principal importance in England[4]. None of the woodland lost meets the planning criterion for ancient woodland, which requires woodland to have been wooded continuously since at least 1600 AD to be counted as ancient[5]. These habitats fall within the Norwich Western Link's biodiversity net gain target and the compensation strategy includes the provision of new compensatory habitat, including the planting of new woodland and enhancement of existing habitat.

The Norwich Western Link will result in the removal of approximately twelve veteran / ancient trees and two important hedgerows; it crosses a Special Area of Conservation, an internationally important area of habitat; and will potentially degrade areas of ancient woodland. These habitats are excluded from biodiversity net gain because they are considered irreplaceable habitats. As a result of this, the Norwich Western Link cannot claim to have achieved overall biodiversity net gain. This is in line with the current good practice principles for biodiversity net gain[6]. The losses of ancient/veteran trees and important hedgerows will be treated using separate strategies that are under development which will help to mitigate the impact of their loss.

The Norwich Western Link will also have an impact on multiple species, including some that are nationally protected due to being rare and/or threatened. Although these species are not directly included in the biodiversity net gain calculation, the compensatory habitat has been designed to provide benefit to most of the impacted species and they have further compensation requirements dictated by other policies. One species that would be impacted is the rare and protected Barbastelle bat (Barbastella barbastellus). Independent surveys found that the original preferred route would directly impact the largest known colony of these bats in the UK[7]. In response to this, the route has been changed to minimise impact on the bats[8], substantially increasing costs from around £200m to around £250m[9]. It is likely that, despite this re-route, the road will still have some impact on the bat colony[10].

51

References: (not required to answer questions, click next below)

- [1] 'Bats Force Western Link Route Change - but Extra Cost Not yet Revealed', *Eastern Daily Press*, 2022 <<https://www.edp24.co.uk/news/local-council/20631895.bats-force-western-link-route-change---extra-cost-not-yet-revealed/>> [accessed 27 April 2023].
- [2] WSP and Norfolk County Council, *Norwich Western Link EIA Scoping Addendum*, July 2022 <<http://eplanning.norfolk.gov.uk/Document/Download?module=PLA&recordNumber=17796&planId=64468&iImageId=1&isPlan=False&fileName=NWL%20Scoping%20Review%20Alignment%20Change%20July%202022.pdf>> [accessed 3 May 2023].
- [3] Stephen Panks and others, *Biodiversity Metric 3.1 - User Guide*, 21 April 2022 <<https://publications.naturalengland.org.uk/file/4711800952848384>> [accessed 3 May 2023].
- [4] Biodiversity Reporting and Information Group (BRIG), *Report on the Species and Habitat Review (UK Biodiversity Action Plan (UK BAP), June 2007)* <https://webarchive.nationalarchives.gov.uk/ukgwa/20140712055944mp_/_http://jncc.defra.gov.uk/default.aspx?page=5705> [accessed 27 April 2023].
- [5] Planning criteria: 'Ancient Woodland, Ancient Trees and Veteran Trees: Advice for Making Planning Decisions', [GOVUK](https://www.gov.uk/guidance/ancient-woodland-ancient-trees-and-veteran-trees-advice-for-making-planning-decisions) <<https://www.gov.uk/guidance/ancient-woodland-ancient-trees-and-veteran-trees-advice-for-making-planning-decisions>> [accessed 27 April 2023].
- [6] J Baker, R Hoskin, and T Butterworth, *Biodiversity Net Gain. Good Practice Principles for Development. A Practical Guide* (London: ciria, 2019) <<https://cieem.net/wp-content/uploads/2019/02/C776a-Biodiversity-net-gain-Good-practice-principles-for-development-A-practical-guide-web.pdf>> [accessed 27 April 2023].
- [7] 'Fears NDR Western Link Could Wipe out "Largest Barbastelle Bat Colony in UK"', *Eastern Daily Press*, 2020 <<https://www.edp24.co.uk/news/local-council/20712580.fears-ndr-western-link-wipe-largest-barbastelle-bat-colony-uk/>> [accessed 28 April 2023].
- [8] 'Western Link's Design Refined Following Bat Surveys - Norfolk County Council' <<https://www.norfolk.gov.uk/news/2022/02/western-links-design-refined-following-bat-surveys>> [accessed 27 April 2023].
- [9] Ashlea Hickin and George Thompson, 'Warnings Road Will Have a "devastating" Impact on Rare Bats despite Reroute', *NorfolkLive*, 2022 <<https://www.norfolklive.co.uk/news/norfolk-news/norwich-western-link-rare-bats-7261952>> [accessed 27 April 2023].
- [10] Mike Jones, 'Why Is the Norwich Western Link a National Issue?', 2023 <<https://www.norfolkwildlifetrust.org.uk/News-and-Articles/Blog/All-Blog-Posts/Why-is-the-Norwich-Western-Link-a-National-Issue>> [accessed 27 April 2023].

Impact of additional information on opinions of Norwich Western Link

52

How much of the information about the Norwich Western Link given in the previous section did you know prior to starting this questionnaire? *

- All of the information
- The majority of the information
- About half of the information
- Some of the information
- None of the information

53

How has the information on the previous page changed your views on the following aspects of the Norwich Western Link? *

	Made my views much more negative	Made my views somewhat more negative	Has not changed my views	Made my views somewhat more positive	Made my views much more positive
Impact on biodiversity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Methods used to address impact on biodiversity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Likelihood developers will meet biodiversity commitments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall view of Norwich Western Link	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

54

If your views have changed, what has changed them? (If no change, please just write "no change" in the box) *

If you could choose where the habitat created or enhanced for the Norwich Western Link would be located, what would be the most important factors? Please click and drag these statements to rank them from most important at the top to least important at the bottom.

If you do not have an opinion on this, please put "No opinion" first and do not worry about the position of the other statements. *

No opinion
Habitat should be on the site of the development
Habitat should be as close as possible to the habitat lost to the Norwich Western Link
Habitat should be located where it has the greatest overall benefit for biodiversity
Habitat should be located where it has the greatest benefit for the people impacted by the Norwich Western Link
Habitat should be located where it has the greatest overall benefit for people
Habitat should be located where it has the greatest benefit for the animals and plants impacted by the Norwich Western Link

If you could choose the habitat types created and/ or enhanced to provide biodiversity net gain for the Norwich Western Link, what would be the most important factors? Please click and drag these statements to rank them from most important at the top to least important at the bottom.

If you do not have an opinion on this, please put "No opinion" first and do not worry about the position of the other statements. *

Habitat should be at least the same distinctiveness/ rarity as what was lost
Habitat should be of high importance in the area where the loss occurred
Habitat should be the best value for money
Habitat should provide access to nature
No opinion
Habitat should be the same type as what was lost
Habitat should benefit the species impacted by loss of habitat
Habitat should be of high national importance

Are there any changes that would make the Norwich Western Link's approach to biodiversity more acceptable in your view? Please describe them here (If there are not, please just write "no" in the box): *

--

NOTE: If the questionnaire does not give you the option to proceed, this may be because one or both rankings were already in the correct order for your answer, changing the position of one statement them moving it back should solve this.

Demographic data

We are collecting this information so we can understand what factors impact people's views on biodiversity net gain and the Norwich Western Link. If you are uncomfortable giving any of this information, feel free to answer "prefer not to say" to any/all of the questions.

59

What is your age? *

- 16-18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 64 or over
- Prefer not to say

60

Which of the following best describes your gender identity? *

- Woman
- Man
- Non-binary
- Prefer not to say

61

What is the highest level of education you have completed? If currently enrolled, please indicate the highest level received. *

- GCSEs or equivalent (e.g. O-levels, CSEs)
- A-levels or equivalent (e.g. International Baccalaureate, BTECs)
- Vocational higher education (e.g. NVQ level 4 and above, higher diplomas (HND), higher national certificate (HNC), professional qualifications, RSA higher diploma, BTEC higher diploma)
- Undergraduate degree (e.g. BA, BSc)
- Master's degree
- PhD
- Other post-graduate certificate or diploma
- Prefer not to say
- Other

What sector do you work in? (Please select the closest answer from the drop down list, sectors are listed in alphabetical order.) *

- Not currently in employment
- Prefer not to say
- Accountancy, banking and finance
- Administration
- Agriculture
- Business, consulting and management
- Charity and voluntary work
- Creative arts and design
- Education
- Energy and utilities
- Engineering, manufacturing and construction
- Environment
- Healthcare
- Hospitality and events management
- Information technology
- Law
- Leisure, sports and tourism
- Marketing, advertising and PR
- Media and internet
- Retail, property and sales
- Security and emergency services
- Science and maths
- Transport and logistics
- Other

Which of the following best describe your ethnicity? Please tick all that apply. *

- Prefer not to say
- White
- Black / African / Caribbean / Black British
- Arab
- Mixed / multiple ethnic groups
- Asian / Asian British
- Other

What is your postcode?

This information is not required, but will help us understand how views change depending on where you live relative to the project. If you feel uncomfortable giving your full postcode, the first section (e.g. NR3, NR20) would still provide useful information.

Opportunity for further input

65

We are looking to gain a deeper insight into people's feelings regarding the Norwich Western Link's approach to biodiversity through carrying out a number of interviews, if you would be happy to be contacted again for this research, please leave your preferred email below:

Submit

The first part of this questionnaire aimed to assess your baseline opinions and level of knowledge about the Norwich Western Link and its approach to biodiversity. We then gave you some more information about the project and biodiversity net gain, the specific method they plan to use to compensate for non-replaceable habitats, to understand whether and how this changed your views. For more information about the Norwich Western Link and its potential impacts, see the Norfolk County Council website.

If you are happy for your responses to be included in our research, please press submit.

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 Microsoft Forms

5B – Participant recruitment

UEA
University of East Anglia

Share Your Perspectives on the Norwich Western Link.



**Environmental costs too high?
Essential to fight rat running?**

We're running a questionnaire to understand people's views on how the Norwich Western Link is balancing the needs of people and nature.

Respond NOW using the QR code
or contact **Alice Stuart** to find out more
Email: astuart.research@uea.ac.uk
Post: Alice Stuart, Office 01.39, School of Environmental Sciences, UEA, Norwich, Norfolk, NR4 7TJ

Your response will contribute to research on opinions on the Norwich Western Link and its impacts on biodiversity. Responses will be anonymous unless you choose to share contact details so you can be contacted for future research.



Figure 5B.1: Leaflet used for participant recruitment.

Table 5B.1: Postcodes included in leaflet campaign and number of addresses in each at the time of planning leaflet campaign (13th October 2023) due to growth in the number of addresses, the total number of addresses increased to 27,226 by the time of booking (31st October 2023).

Postcode Sector	Number of Addresses
NR5 0	3,790
NR8 5	3,327
NR8 6	6,835
NR9 5	2,357
NR10 3	4,826
NR10 4	2,747
NR20 3	3,296
TOTAL	27,178

5C – Specific impacts of the NWL

Within the questionnaire, we asked respondents to use a Likert scale to describe eight specific impacts of the NWL: personal, community, local economy, national economy, climate, local nature, national nature, and biodiversity. All impacts measured were highly positively correlated (Figure 5C.1).

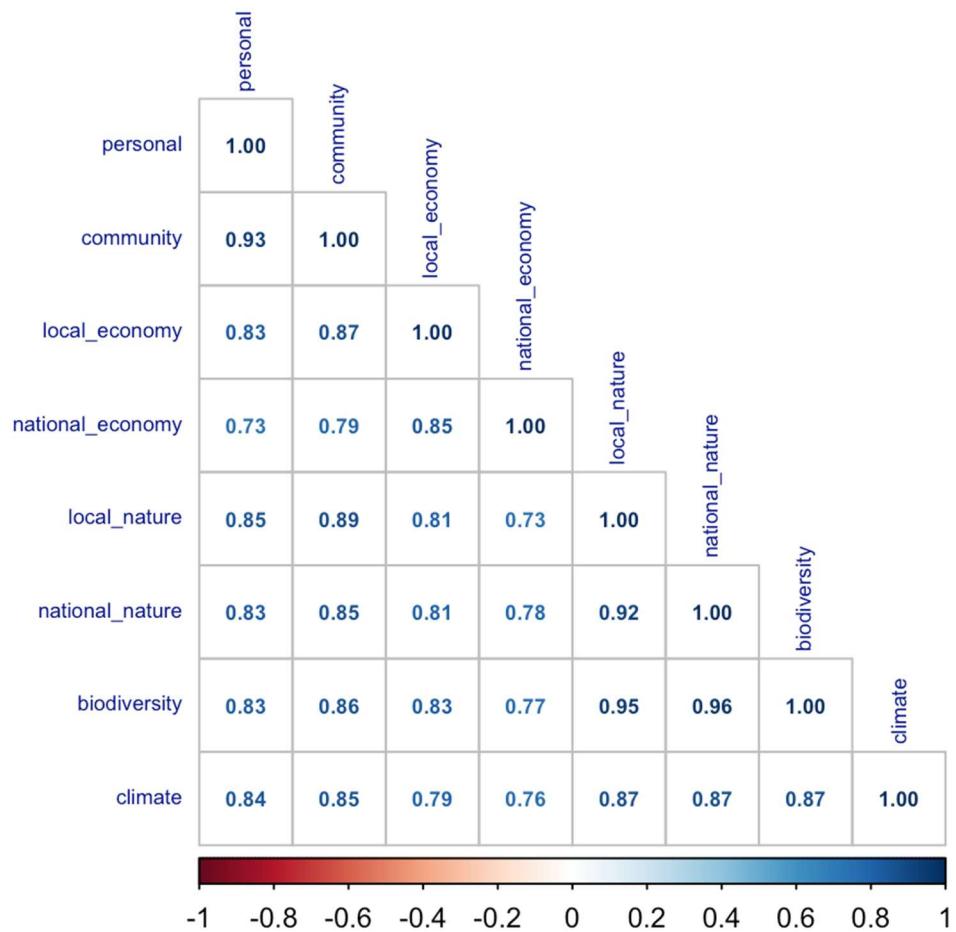


Figure 5C.1: Polychoric correlations between all specific impacts measured.

To make these results easier to interpret, and understand whether and how perceptions of these specific impacts group, we carried out an exploratory factor analysis, similar to that carried out in Richert *et al.*, (2015). Using parallel analysis and Velicer's minimum average partial (MAP) criteria to determine the correct number of factors and “promax” rotation, as recommended in (Basto & Pereira, 2012), we determined that the impacts load onto two factors, shown in Figure 5C.2. Factor 1 contains the four impacts we originally conceived to be “environmental impacts” and factor 2 contains both economic impacts, as well as personal and community impacts. Thus, factor 2 represents some mixture of pragmatic and moral consequential legitimacy (per Chapter Two), which we will label “social impacts” for the sake of this paper.

To generate scores for the two factors, we used the non-refined or “course” approach of calculating unit-weighted sum (or in this case mean) scores for questions with a factor loading above a necessarily arbitrary cut-off value (DiStefano et al., 2009; Grice, 2001), in this case 0.5, chosen out of a desire to have each question contribute to only a single factor. We recognise that this is a relatively primitive method, but believe it to be appropriate for our purpose of approximating each factor for visual comparison and the direction of future research, as opposed to an intricate analysis in-and-of itself (McNeish & Wolf, 2020). This resulted in measures that ranged from -2 to 2, with higher values indicating a more positive view of the impacts and 0 indicating some level of neutrality. We calculated the Cronbach alpha coefficient for each measure to estimate their internal consistency, assuming the generally accepted minimum threshold of 0.7 (Nunnally and Bernstein, 1994 per Richert et al., 2015). “Social impact” and “Environmental impact” had standardised Cronbach alpha coefficients of 0.95 and 0.97 respectively, confirming they can be treated as measuring a single construct. One thing to note is that “Environmental impact” had a higher Cronbach alpha coefficient when climate was excluded from the factor (0.96), implying including climate makes it a less homogeneous construct. As such we have included a scatter plot of “Social impact” and “Environmental impact” when calculated as the average of national nature, local nature, and biodiversity to show this produced the same result Figure 5C.2.

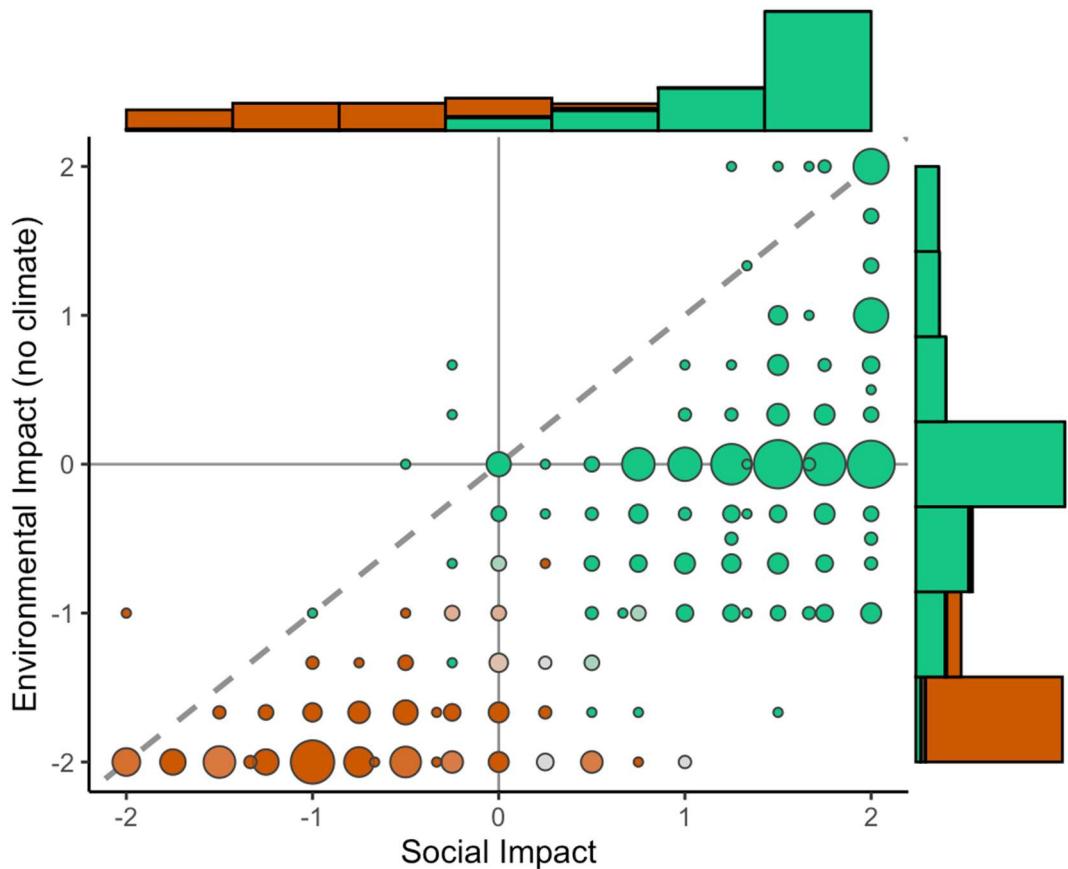


Figure 5C.2: Respondents' perceptions of the "Social impact" (average of perceived personal, community, local economy and national economy impacts) and "Environmental impact" minus climate (average of perceived local nature, national nature, biodiversity). Both measures range from -2 to 2, having been averaged from a five-point Likert response question with the options "very negative" (-2) / "somewhat negative" (-1) / "neither positive nor negative" (0) / somewhat positive (1) / "very positive" (2). As such, higher values indicate a more positive view of the impacts and 0 indicates some level of neutrality. Marginal plots show the frequencies of perceptions of each impact, with colour showing whether the respondent was against the NWL (darker red), not against the NWL (lighter green), or did not know if they were against the NWL (dark grey).

5D – Modelling effect of existing knowledge on judgement of NWL's plan to address biodiversity impacts

To understand whether and how existing knowledge affects judgements on the NWL's plan to address biodiversity, we created a binomial general linear model with the following formula:

```
glm(formula = adequate_plan ~ nwl_text_known * longer_nwl_text +  
  bng_text_known * metric_info, family = binomial(link = "logit"),  
  data = plan_vs_knowledge_data)
```

The variables were:

- `adequate_plan`: logical, whether the respondent thought there was an adequate or better plan in place to address biodiversity impacts (`TRUE`) as opposed to either no plan, or a poor or worse plan (`FALSE`) or not knowing whether there was a plan or the plan quality (`NA`)
- `nwl_text_known`: ordered factor, the amount of the text on the NWL the respondent reported they knew (levels: “None of the information”, “Some of the information”, “About half of the information”, “The majority of the information”, “All of the information”)
- `longer_nwl_text`: logical, whether the respondent chose to see the more detailed version of the NWL text (`TRUE`) as opposed to the shorter version (`FALSE`)
- `bng_text_known`: ordered factor, the amount of the text on BNG the respondent reported they knew (levels: “None of the information”, “Some of the information”, “About half of the information”, “The majority of the information”, “All of the information”)
- `metric_info`: logical, whether the respondent chose to see the additional information on the metric used in BNG (`TRUE`) or not (`FALSE`)

The results were as follows:

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.52925	0.26857	5.694	1.24e-08 ***
nwl_text_known.L	-0.32862	0.65986	-0.498	0.6185
nwl_text_known.Q	0.29198	0.56946	0.513	0.6081
nwl_text_known.C	0.48508	0.37746	1.285	0.1987
nwl_text_known^4	-0.09917	0.29113	-0.341	0.7334
longer_nwl_textTRUE	2.62455	109.89166	0.024	0.9809
bng_text_known.L	-0.52124	0.60201	-0.866	0.3866
bng_text_known.Q	-0.21310	0.53172	-0.401	0.6886
bng_text_known.C	-0.51462	0.36924	-1.394	0.1634
bng_text_known^4	0.08060	0.33981	0.237	0.8125
metric_infoTRUE	-1.48954	0.33549	-4.440	9.00e-06 ***
nwl_text_known.L:longer_nwl_textTRUE	-9.05177	347.50760	-0.026	0.9792
nwl_text_known.Q:longer_nwl_textTRUE	7.37622	293.69765	0.025	0.9800
nwl_text_known.C:longer_nwl_textTRUE	-4.65747	173.75416	-0.027	0.9786
nwl_text_known^4:longer_nwl_textTRUE	2.25664	65.67430	0.034	0.9726
bng_text_known.L:metric_infoTRUE	1.65633	0.91981	1.801	0.0717 .
bng_text_known.Q:metric_infoTRUE	-0.15274	0.82588	-0.185	0.8533
bng_text_known.C:metric_infoTRUE	0.12308	0.57851	0.213	0.8315
bng_text_known^4:metric_infoTRUE	-0.07774	0.49727	-0.156	0.8758

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 '' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 573.94 on 441 degrees of freedom

Residual deviance: 491.39 on 423 degrees of freedom

(195 observations deleted due to missingness)

AIC: 529.39

Number of Fisher Scoring iterations: 13

As the interaction terms were not significant, we re-ran the model with no interactions to ensure they were not masking any significance, the results mirrored the original model:

Call:

```
glm(formula = adequate_plan ~ nwl_text_known + longer_nwl_text +  
  bng_text_known + metric_info, family = binomial(link = "logit"),  
  data = plan_vs_knowledge_data)
```

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.47091	0.21670	6.788	1.14e-11 ***
nwl_text_known.L	-0.51107	0.55952	-0.913	0.3610
nwl_text_known.Q	0.37562	0.47278	0.794	0.4269
nwl_text_known.C	0.31145	0.30988	1.005	0.3149
nwl_text_known^4	0.14571	0.23678	0.615	0.5383
longer_nwl_textTRUE	-0.21999	0.24121	-0.912	0.3618
bng_text_known.L	0.18654	0.42051	0.444	0.6573
bng_text_known.Q	-0.58060	0.35218	-1.649	0.0992 .
bng_text_known.C	-0.42287	0.25205	-1.678	0.0934 .
bng_text_known^4	0.02703	0.24731	0.109	0.9130
metric_infoTRUE	-1.54594	0.23881	-6.474	9.57e-11 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 '' 1				
(Dispersion parameter for binomial family taken to be 1)				
Null deviance: 573.94 on 441 degrees of freedom				
Residual deviance: 500.14 on 431 degrees of freedom				
(195 observations deleted due to missingness)				
AIC: 522.14				
Number of Fisher Scoring iterations: 4				

References

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