What motivates and enables private sector engagement with NbS? Insights from the Scotch Whisky Sector

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Executive summary

It is widely recognised that greater private sector engagement is needed in the management of natural resources, including in Scotland. This study explored when, why, and how whisky producers engage with nature, and identified opportunities to expand this engagement in the future.

Our findings show that companies engage with nature in different ways, and a diverse range of Nature-based Solutions (NbS) are already being implemented across the whisky sector. These initiatives range from actions on company-owned land to landscape-scale projects, which are more commonly associated with larger whisky producers. However, many companies view land ownership as a barrier to broader engagement and therefore focus their efforts on land they directly control.

Companies also adopt different roles in delivering NbS. Those involved in landscape-scale initiatives typically take a collaborative approach, working with partners such as environmental NGOs, academic institutions, and other stakeholders. These partnerships increase access to knowledge, skills, and resources; enabling more ambitious projects. Although natural capital data and assessment tools are being used within the sector to monitor environmental conditions and changes over time, their application remains limited for planning NbS and informing investment decisions.

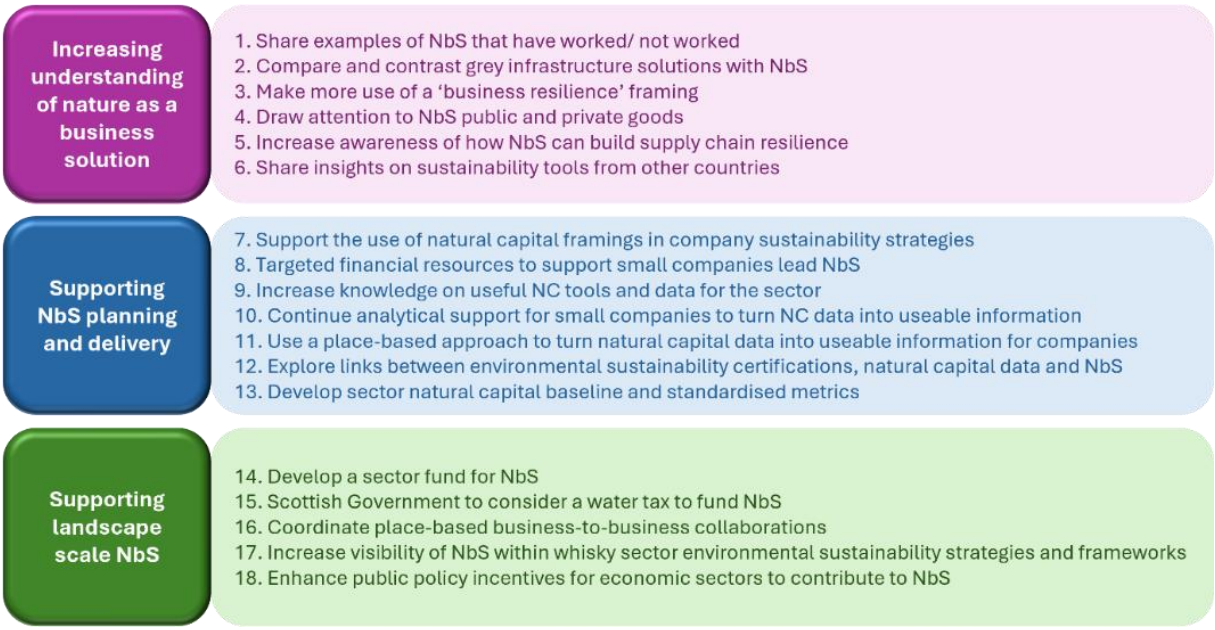
Companies are motivated to implement NbS for a range of reasons, including regulatory compliance, reputation management, operational resilience, and moral responsibility. Compliance and reputational considerations are the most commonly cited drivers. Operational resilience refers to efforts to work with nature in ways that help secure the long-term supply of ecosystem services that are critical for whisky production, such as water quality and availability. Some companies, particularly newer and independently owned producers, are also motivated by a strong ethical commitment to enhancing nature – which can also provide co-benefits.

While operational resilience is one of the less frequently cited motivations, it is often a key driver for companies undertaking landscape-scale NbS. These larger-scale initiatives are also associated with compliance and reputational objectives, suggesting that landscape-scale NbS are frequently motivated by a combination, or bundle of business benefits.

The study identified a range of organisational, sector-specific, and external factors that influence whether and how companies engage with NbS. Organisational factors include the extent to which environmental sustainability goals align with a natural capital approach, as well as the availability of people, knowledge, skills, and financial resources. A lack of knowledge and skills were identified as barriers to the effective use of natural capital data and tools.

Where organisational constraints limit involvement, sector-specific factors can help overcome these barriers. The whisky sector's strong culture of collaboration, together with support from representative bodies such as the Scotch Whisky Association (SWA), can be particularly valuable, particularly the latter for smaller producers. External factors can also help overcome organisational constraints, especially access to suitable partners who can contribute knowledge, skills and resources.

Participants identified several opportunities to increase the uptake of NbS across the whisky sector to increase understanding of nature as a business solutions, better support NbS planning and delivery, and to better enable landscape scale NbS (see below).



Overall, unlocking greater investment in NbS will require recognising the diversity of businesses within the sector, including differences in business models, resource availability, and dependence on local landscapes.

Key recommendations for unlocking investment in the whisky sector are:

- Increase awareness of NbS within companies and demonstrate how working with nature can support long-term business performance. Efforts should target both corporate decision-makers responsible for setting sustainability objectives and sustainability teams seeking practical solutions to environmental challenges.
- Explicitly frame landscape-scale NbS as a means of strengthening business and ecosystem resilience, while highlighting the multiple benefits that can arise from collaboration at wider landscape scales.
- Improve access to sector-relevant natural capital data and tools, alongside the skills and expertise needed to use them effectively in investment decision-making and NbS planning.
- Support the development of partnerships between companies and other stakeholders to increase involvement in landscape-scale NbS. Collaborations with environmental NGOs, academic institutions, and other businesses can help address knowledge, skills, and resource constraints.
- Encourage wider adoption of established collaborative frameworks, such as Landscape Enterprise Networks (LENs), which facilitate cooperation within local landscapes and across sectors, including farming and other land-based industries.

More broadly, the diversity in motivations and activities of whisky producers provides valuable insights for other sectors seeking to increase business involvement in NbS. In particular, governments promoting high-integrity nature markets should recognise that these are only one pathway for encouraging private sector engagement. Businesses may also be motivated to invest in nature where it helps safeguard and strengthen their operational resilience, creating more opportunities for large-scale action.

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List of acronyms

LENS	Landscape Enterprise Networks
NbS	Nature-based Solutions/ nature-based interventions
NC	Natural Capital
NGO	Non governmental organisation
SEPA	Scottish Environment Protection Agency
SWA	Scotch Whisky Association

1. Introduction

Ecosystem degradation is a societal challenge, as nature provides multiple goods and services that society depends on. These challenges are further exacerbated by a rapidly changing climate. In past decades, caring for nature has often been seen as something for environment agencies and third sector groups. However, to create a more sustainable future, all sections of society need to act. This includes business (for profit) actors across economic sectors (Lamont et al., 2023).

Nature-based Solutions (NbS) is an umbrella term used to describe interventions that work to protect and improve natural processes and the ecosystem services that arise through them (Nesshöver et al., 2017). NbS therefore entail action with and for the natural environment, driven by different socio-economic challenges. By focusing on how nature can support socio-economic goals (rather than managing nature for its own sake), NbS can motivate the involvement of business actors in protecting and improving natural environments.

Natural capital represents a different way of thinking about the relationship between ecosystems and economic activities – bringing to the fore the multiple ways the natural environment supports economic activities, which are particularly important for business activities within some sectors. For example, in Scotland industries reliant on natural capital in Scotland (excluding non-renewable resources sectors such as oil and gas) contribute 14.4% of total economic output: the most reliant economic sectors are agriculture, fishing and aquaculture, forestry and wood products, water and sewage, spirits / wine and beer / malt sectors, and electricity (Scottish Government, 2024a). The premise underpinning a natural capital approach is that making these connections more visible will inform and influence decision making – leading to investment in conserving natural assets.

The use of natural capital tools and data is assumed to aid in the transition towards thinking about the natural environment as a business asset, and in taking action by informing planning or investment choices. However, decisions are influenced by many sources of insight and information, and furthermore are typically driven and constrained by multiple factors, not solely information. As an example, the influence of individuals and teams with sustainability roles are generally guided and constrained by corporate-level sustainability goals and assumptions about the relevant scope of actions (Luederitz, Caniglia, Colbert, & Burch, 2021). Considering the agency, constraints and motivations of business actors – and the individuals within them is therefore helpful to understand the roles of any tools and data.

Better understanding how and why business chose to work with nature could provide valuable insights on how to support the involvement of business actors across economic sectors in protecting and restoring natural environments, and the role of natural capital data and tools within that.

The aim of this study therefore is to examine what, why and how whisky producer companies are working with nature and how this could be further strengthened in future.

This study addresses the following research questions;

1. How and when do whisky producer companies get involved in activities related to NbS?
2. Why do whisky producer companies get involved in activities related to NbS?
3. Do Natural Capital framings play a role in business involvement in NbS?
4. Do Natural Capital tools and data play a role in business involvement in NbS?

The structure of this document is as follows. We first explain the conceptual background for this study – incorporating the concept of human agency of business actors alongside the concept of Nature-based Solutions as a way of acting and Natural Capital as a way of thinking about the relationships between economic activities and the natural environment. This is followed by the methodology used and background to the selected case study – whisky production companies in Scotland. We then present the findings followed by a discussion of the implications of this study with particular focus on how policy can better support the sector in planning and delivering more ambitious NbS type interventions.

2. Conceptual background

2.1 Nature-based Solutions and business actors

NbS are interventions that work with and improve natural processes to address socio-economic challenges. For example, NbS are considered relevant for helping to tackle climate mitigation objectives and climate adaptation needs, for reducing flood and drought risk, to reduce heat stress and to create economic opportunities (Dumitru & Wendling, 2021). The NbS concept is action-orientated and positions nature-related interventions as a remedy rather than a hinderance to human activity (Sowińska-Świerkosz & García, 2022).

NbS is a broad concept that encompasses multiple types of interventions and is closely linked to concepts such as green infrastructure (Nesshöver et al., 2017) natural flood management (Short, Clarke, Carnelli, Uttley, & Smith, 2019) and natural climate solutions (Osaka, Bellamy, & Castree, 2021). Whilst these interventions utilise natural processes, they are context specific and may also include engineered elements, particularly in urban areas (Eggermont et al., 2015). In this study we adopt the internationally recognised International Union for Conservation of Nature (IUCN) definition of NbS as: "*actions to protect, sustainably manage, and restore natural or modified ecosystems, which address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits*." (IUCN, 2016). The potential to provide multiple benefits brings to the fore the relevance of planning and applying NbS at a landscape scale for NbS capable of improving socio-ecological resilience (Lafortezza, Chen, Van Den Bosch, & Randrup, 2018).

While NbS type interventions involve benefits for the natural environment, this is not the goal – rather, sustaining and improving ecosystems is a means to an end. The NbS concept is therefore recognised as providing a pathway to support greater involvement of business actors across economic sectors in improving the natural environment to guide more environmentally sustainable collective futures (Di Pirro, Sessa, Zhou, & Sica, 2025). This has led to an increasing focus on mainstreaming NbS, understood as a process through which NbS as a marginal idea and practice becomes embedded within a system, such as an economic sector (Carmen, Ibrahim, Blackstock, & Waylen, 2024; Xie, Bulkeley, & Tozer, 2022).

Governance barriers hindering the uptake of NbS across contexts and by business actors have been identified relating to social, political, cultural and economic factors. A lack of governance arrangements enabling collaboration and partnership working is a widely recognised barrier, for example for the involvement of business actors in achieving landscape scale NbS. Specifically this includes high transaction costs and pre-existing tensions between actors (Malekpour, Tawfik, & Chesterfield, 2021). Adequate data and expertise to apply this to inform business decision making is a further known governance barrier to the uptake of NbS (Van Der Jagt et al., 2023). Evidence of the effectiveness of NbS is also a widely acknowledged barrier (Ershad Sarabi, Han, Romme, de Vries, & Wendling, 2019).

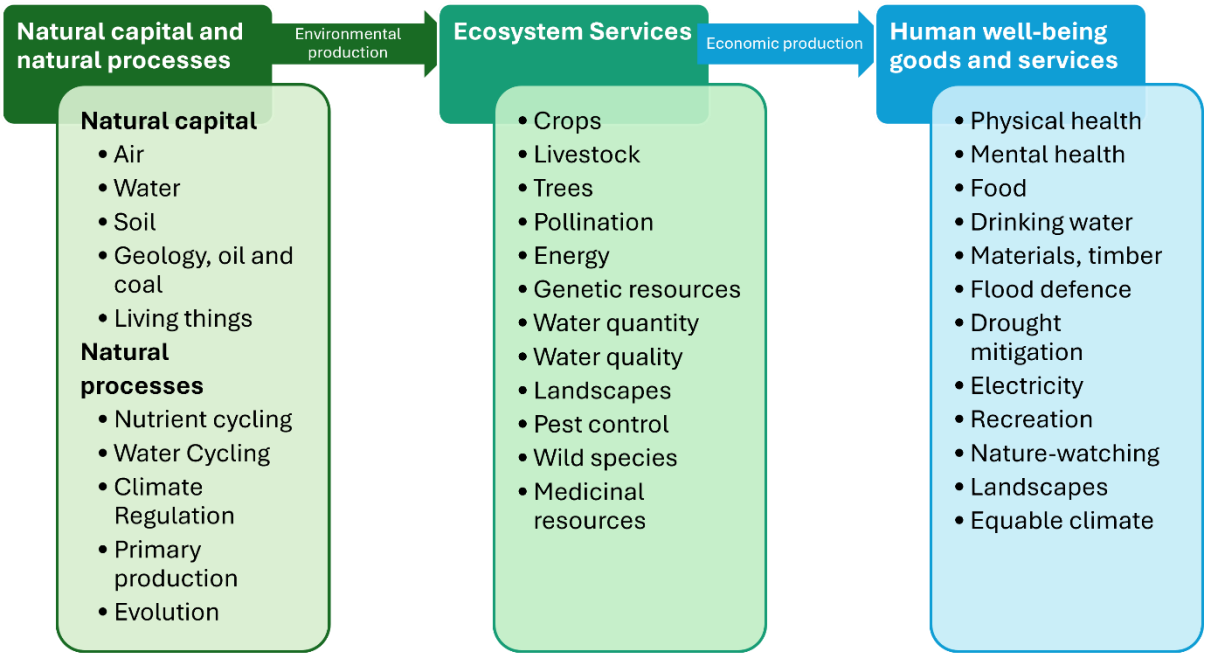
A further barrier relates to the type of institutional structures that may limit integrated approaches within an organisation and lead to a lack of attention or contradictions within legal, regulatory and policy frameworks (Van Der Jagt et al., 2023). A additional barrier, linked closely to a lack of business involvement in NbS, is a lack of financial mechanisms and incentives with the cost of delivering and managing NbS (Dorst et al., 2022).

Knowledge about NbS is also a barrier to the uptake of NbS – where actors are unaware of the option to work with nature to address socio-economic challenges (Chappin et al., 2024). Furthermore, while business challenges linked to the natural environment may be recognised as relevant to business actors, existing social norms may assume other actors are responsible for improving nature and the ecosystem goods and services that may arise (Dorst et al., 2022).

2.2 Natural capital

The natural capital concept presents an anthropogenic way of thinking about the natural environment (Bateman & Mace, 2020). It defines living and non-living features of ecosystems as an asset (e.g. soil, air, water, geology) which interact to yield ecosystem services (e.g. water quantity, quality, carbon sequestration) and which in turn underpins (in multiple ways) human activity and wellbeing (Barbier, 2019; Guerry et al., 2015). A decline in natural ecosystems is therefore an economic risk, particularly for economic sectors with direct dependencies on ecosystem goods and services. Natural capital therefore reframes thinking about the relationship between ecological and the economy – orientating thinking away from the economy being alongside the environment, to a view of the economy within the environment (Trim & Jones, 2025). There has however been critiques of the natural capital concept in terms of the commodification and privatisation of nature, reflected in the concept being widely conflated with a narrow focus on financial investment and potential returns with the need for new markets to coordinate such transactions (Levidow, 2020).

Figure 1: A natural capital framing



Adapted from Bateman and Mace (2020)

The key premise underpinning a natural capital approach is that much ecosystem degradation has arisen as a consequence of the invisibility of nature in decision making by industry (the focus on this study) (Levidow, 2020) and across policy (Martino, Patil, Martinat, Ballesteros, & Waylen, 2026). This has led to a policy focus on enabling better natural capital accounting across industry, through frameworks and tools and data to better quantify natural assets and ecosystem services (Glass, Waylen, Reed, Peskett, & Stevens, 2025).

Natural capital can also be approached as a business strategy that can encompass financial and reputational risk management (Levidow, 2020). This can entail a strategic focus on sustaining natural capital to secure the ecosystem goods and services provided and strategies that considered nature in terms of new sources of income and new business activities (Ruijs & van Egmond, 2017). This broader approach is in part a response to the perceived market failures and institutional barriers which have led to a decoupling of ecological and economic systems (Guerry et al., 2015).

Identified barriers to operationalising a natural capital approach include data availability and access, data fit with temporal and spatial business needs, capacity to work with NC data and undertake NC accounting audits, and the ability for businesses to understand NC related costs and incentives (Ingram et al., 2024). Therefore natural capital is a way of thinking about the relationships between economic activities and nature, yet operationalising this way of thinking may be motivated by different business needs.

An implicit assumption is however that a natural capital way of thinking will motivate companies to actively work towards nature recovery and reinstatement/ restoration of nature, and natural capital data will enable operationalisation of natural capital into practice (White, Mukherjee, Petrovan, & Sutherland, 2023). However, few companies are recognising nature as a material asset and are acting to conserve and improve it (Trim & Jones, 2025). Furthermore, the complexity of connections between economic activities and nature creates uncertainty and therefore increases risk perception of economic actors. This can lead to more cautious responses to natural capital by industry (Mace, 2019).

2.3 Agency of business actors

Human agency as a concept resonates across social science whilst being vague (Abdelnour, Hasselbladh, & Kallinikos, 2017). Broadly it relates to the ability of an actor (e.g. an individual, a group or an organisation) to pursue intentions in a value-aligned way (Pelenc, Bazile, & Ceruti, 2015). Agency is situationally embedded, enacted through social action and is key to understanding change (Schürer, 2025). Through action actors create and recreate, to a greater or lesser degree, wider institutional patterns by enacting and reenacting social norms and practices (Funder, Wlokas, Jhetam, & Olsen, 2021). Perceptions of past experiences, future possibilities and judgements of the present options in response to emerging needs, dilemmas and ambiguities in part influence human agency (Emirbayer & Mische, 1998).

Sustainability strategies (the type of objectives, how these are realized and the type of value that is generated) can support different business needs such as (legal) compliance, profit seeking, strategic business development and stakeholder relationships (Shourkaei, 2025). Compliance is often a dominate objective however, with much less attention on how sustainability can enhance business performance (Kitsios, Kamariotou, & Talias, 2020; Manninen & Huiskonen, 2022). Compliance is a motivation linked to financial objectives of business however other factors also influence business performance. Other types of motivations are also starting to be recognised, including prosocial

motivations (i.e. altruistic nature and social values) and the personal needs or desires of business leaders (Luederitz et al., 2023).

The presence and content of a formalised corporate sustainability strategy may be necessary to help large corporations better navigate the complexity within and surrounding large organisations, yet provides few insights about how business actors are able to achieve outcomes in reality. In business contexts human agency brings to the fore the idea that the type of action and change that emerges is not solely determined by organisational objectives as directed by corporate managers (Potosky & Azan, 2023). Agency to pursue sustainability is however influenced by a mix of actor-related and contextual factors (Lespinasse-Camargo, Eustachio, Bonifacio, Macini, & Caldana, 2024). These include roles within an organisation which influence available resources and obligations (Abdelnour et al., 2017), skills, available expertise, personal judgement and links to other actors via relationship and networks (Luederitz et al., 2021). Factors guiding implementation of corporate sustainability strategies include leadership, organisational culture, knowledge sharing, corporate targets and external market factors (Manninen & Huiskonen, 2022). The ability to strengthen the link between value creation for business and society through sustainability is premised on interconnectedness (i.e. embedded and place based) (Moon & Parc, 2019), decentralised decision making and planetary boundaries (Shourkaei, 2025) and collaboration (Panwar, Ober, & Pinkse, 2022).

3. Methodology

A qualitative research strategy was adopted in this study (Ritchie & Lewis, 2003). An abductive approach was used, which entails 'grounding theoretical understandings of the contexts and people in the language, meanings and perspectives' of participants (Bryman, 2016, p 394). This choice was informed by prior theoretical work on the multiple factors likely to shape decision making from the business management and NbS governance literature (Carmen E. & Waylen, 2023) (see milestone 4.1), while also being sensitive to other perspectives and meanings emergent from the data. A case study research design was used, focusing on whisky production companies in the Scotch Whisky sector.

3.1 Case study background

The Scotch Whisky sector involves actors and activities across the production, bottling, marketing and distribution of whisky made in Scotland. The earliest record of Scotch Whisky is from 1494 and has since developed into an important economic sector within Scotland, contributing 72% of Scottish food and drink exports and 23% of all of Scotland's international goods exports in 2025. (Scotch Whisky Association, 2024).

Scotch Whisky has five distinct geographical regions (Highlands, Speyside, Lowlands, Islay, and Campbeltown) (Scotch Whisky Association, unkown). In total (as of May 2026) there are 154 operational distilleries producing whisky across Scotland, with more underway. Speyside, in the northeast of Scotland, has over 50 distilleries (Liski, Melville, & Metzger, 2018).

Whisky is made from only three ingredients – water, cereals, and yeast. Peat can be used in the malting process to impart peated character, which is used in some whiskies. Scotch whisky must be matured in oak barrels for at least 3 years, though it is often matured for longer (Scotch Whisky Association, unknown).

Water is essential to the production of whisky for mashing, as well as cleaning and cooling purposes, with the source of high-quality water often being a core factor in the siting of distilleries (Glendell et

al., 2024; Liski et al., 2018). Cooling water is the largest water use in distilleries which is returned to the environment after use (McBoyle, 1996).

In recent years, water scarcity has posed challenges for sectors including the Scotch Whisky industry, and these risks are projected to worsen due to a changing climate (Visser-Quinn, Beevers, Lau, & Gosling, 2021). This has the potential to lead to an increase in enforced shut down periods to comply with abstraction licence conditions (Glendell et al., 2024).

Scottish nature and landscapes are frequently used in the marketing of Scotch Whisky (McBoyle, 1996). Some companies have already started to work with nature, often to improve the quality of water discharges, e.g. by developing treatment wetlands (Cakin, Marcello, Morrissey, Gaffney, & Taggart, 2025) or to mitigate water scarcity issues (e.g. Chivas Brothers use of leaky barriers on the Glenlivet Estate that began in 2018) However reducing emissions from energy used in the sector dominates environmental sustainability activities within the sector (Brand Scotland, 2024).

Box 1: **The Scotch Whisky Association**

The Scotch Whisky Association (SWA) is the trade association for the Scotch Whisky industry, representing over 90 companies. The SWA's aims include securing a sustainable future for the sector. The SWA's governance structure involves a council of up to 16 representatives from member companies, which oversees committees informed by a range of working groups. Industry sustainability working groups include Water & Effluent, Peat supply chain and Cereals, among others. The SWA launched its first Environment Strategy in 2009. This was revised in 2021 and identifies four strategic priorities: 1. Tackling climate change; 2. Moving to a circular economy; 3. Using water responsibly; and 4. Caring for the land.

In 2023 the SWA published a Water Stewardship Framework, which sets a water use target of 12.5-25l/LPA (litres of water used per litre of pure alcohol produced), and a Commitment to Responsible Peat Use for the sector. Guidance providing 'Principles of Responsible Peat Extraction' has been published this year. Furthermore, a 'Resilient Cereals Framework' is under development. The SWA also compiles case studies and shares best practice across the sector, including a focus on water stewardship and resilient cereal supply.

In support of knowledge exchange, the SWA engages with key stakeholders and partners, for example, hosting a recent secondment from the RSPB to explore NbS interventions in the sector. In 2025 the SWA provided funding for river restoration coordinated by the Spey Catchment Initiative with further funding now allocated for follow on interventions in the upper Spey catchment. Furthermore, in 2026 the SWA produced a report on Nature-based Solutions with case studies from across the sector. The SWA also contributed seed funding for the Peatland Restoration Foundation, which aims to support small and medium sized peat using whisky companies in Scotland to restore more peat than they use.

3.2 Methods and Materials

Multiple methods were used in this study. These were: 1. Semi-structured interviewing; 2. Workshop; and 3. Document analysis (see Table 1).

Since the research involved interaction with human participants, ethical approval was obtained from the James Hutton Institute Ethics Committee, and Social Research Approval from RESAS. Informed consent was obtained from participants prior to all interviews and the on-line workshop, which were

all conducted on-line and audio recorded. All data has been stored securely and managed and processed in accordance with UK GDPR.

3.2.1 Data collection

The primary data collection method used in this study was semi-structured interviewing. 16 semi-structured on-line, 1-hour interviews were conducted from June 2024 – September 2025 using Microsoft Teams. To guide discussions an interview guide was developed (see Appendix 1 - Interview guide). Initial questions aimed to explore how companies were engaging with environmental sustainability followed by more specific questions about how and why companies are working with nature. Prior to each interview on-line materials relating to environmental sustainability priorities and activities were rapidly reviewed helping to refine probing questions for each interviewee. Interviewees were informed of the key issues to be explored prior to each interview. Interviewees verified if a company had a formal sustainability strategy and if the research team had the most recent version. Each interview was audio recorded and transcribed verbatim and memos were written to inform analysis (see section 3.2.2 below).

A purposive sampling was used to identify potential study participants with the aim of including whisky producing companies of different sizes, approaches to environmental sustainability and involvement in nature-based interventions in Scotland and across geographies. A snowballing strategy was used to recruit study participants. First, a list of companies was developed drawing on existing research networks and scoping discussions with the Scotch Whisky Association. This was supplemented by a rapid desk-based review to identify further companies. This led to identification of 36 companies, 28 of which were emailed to invite them to participate in the study. Invites were addressed to sustainability coordinators, with 16 such named individuals identified in the scoping stage. In total individuals with a sustainability remit from 16 whisky production companies were interviewed.

After initial analysis of the interviews, an online 2-hour sector workshop in April 2026 was also used to further explore barriers, opportunities and ideas for improving the uptake of NbS within the sector, and the use of natural capital data and tools for informing NbS in the sector. First, workshop participants were provided an overview of the study and interim finings relating to how and why companies are currently working with nature, the challenges and opportunities for greater uptake of NbS in the sector, and the use of natural capital data and tools in the sector. Second, small group discussions were held with participants. Participants were divided into 4 groups (large companies, smaller traditional companies, new independent companies, and intermediary organisations) and facilitated parallel discussions undertaken. The first set of parallel discussions focused on sector challenges and opportunities while the second set explored the use of natural capital data and tools. Each group discussion was facilitated by a member of the research team.

All 16 companies who participated in the interviewing stage were invited to participate in the workshop of which 9 company representatives attended. Some individuals had been interviewed, whereas some company workshop attendees were new to the study. Furthermore, key intermediary organisations who seek to support environmental sustainability action across the sector were also invited to participate. Workshop participants therefore also included the Scotch Whisky Association (see Box 1: **The Scotch Whisky AssociationThe Scotch Whisky Association**), Verture (a climate resilience non-government organisation) and two regional public sector Enterprise Agencies. A hydrology and nature-based solutions expert from the James Hutton Institute also participated in the

workshop[1]. Background information and an agenda was provided to all invitees prior to the workshop and a detailed workshop plan developed. In total 16 individuals participants in the workshop from 14 organisations.

Furthermore, company strategic documents setting out how companies aim to address environmental sustainability issues were also collected. These were identified from company websites and by interviewees. These documents included formal corporate sustainability strategies, environmental policies and sustainability webpages.

Table 1: Study participants

Company name	Description	Whisky region [2]	Interview	Workshop	Strategic environmental sustainability document
1. Angus Dundee	Whisky production company with two distilleries in Scotland	**Lowlands**	Yes	Yes	No
2. Adelphi	Whisky company focused on bottling and since 2014 producing whisky from one distillery	**Highlands**	Yes	No	In part - website sustainability pages
3. Arbikie	Company producing vodka, gin and (now) whisky from one distillery	**Highlands**	Yes	Yes	In part - impact report
4. Chivas	Large multinational drinks company that includes production of single malts and blended whisky from ~ 13 distillery sites in Scotland	**Speyside/ Highlands/ lowlands**	Yes	Yes	Yes
5. Diageo	Large multinational drinks company that includes production of single malts and blended whisky from ~ 31 distilleries	**Highlands/ Islay Speyside/ Lowlands**	Yes	Yes	Yes
6. Edrington	Large multinational drinks company that includes production of single malts and blended whisky from three distilleries	**Speyside/ Highlands**	Yes	Yes	Yes
7. Elixir	Multinational drinks company primarily focused on bottling but now also includes production of single malts and blended whisky from two distillery sites	**Speyside/ Islay**	Yes	Yes	In part - an environmental policy
8. Glen Wyvis	Community owned whisky (and gin) distillery	**Highlands**	Yes	No	In part - sustainability webpage
9. Glenallachie	Whisky production company (blended and a single malt) with one distillery	**Speyside**	Yes	No	In part - sustainability webpage

[1] Positionality was carefully considered during analysis of workshop data to ensure no undue influence of ideas shared by this participant in the findings of this study (Schiellerup, 2008).
[2] For a map of whisky regions see https://www.scotch-whisky.org.uk/discover-scotch/enjoying-scotch/scotch-whisky-regions/

10. Glenmorangie	Whisky production company (single malts) from one distillery site	**Highlands**	Yes	Yes	In part - sustainability webpage
11. The Glenturret	Whisky production company (single malts) from one distillery site	**Highlands**	Yes	No	Yes
12. Kilchoman	Whisky production company (single malts) with 9 distilleries on Islay	**Islay**	Yes	Yes	In part - sustainability webpage
13. Moffat	Whisky production company (single malts) from one distillery site	**Lowlands**	Yes (2 people)	No	In part - website sustainability pages
14. Nc'Nean	Whisky production company (single malts) from one distillery site	**Highlands**	Yes	Yes	In part - website sustainability pages
15. Suntory	Large multinational drinks company that includes production of single malts and blended whisky from 5 distilleries in Scotland	**Islay/ Lowlands/ Highlands**	Yes	No	Yes
16. Tomatin	Whisky production company (blended and a single malt) with one distillery	**Highlands**	Yes	No	In part - website sustainability pages
17. Scotch Whisky Association	Industry association (see Box 1)	**All**	-	Yes	-
18. Verture	Non-government Organisation focusing on building resilience to climate change	-	-	Yes	-
19. Southern Scotland Enterprise Agency	Regional public agency	**Lowlands**	-	Yes	-
20. Highlands and Island Enterprise Agency	Regional public agency	**Highland/ Islay**	-	Yes (2 people)	-
21. James Hutton Institute	Hydrologist and freshwater NbS scientist	-	-	Yes	-

3.2.2 Data analysis

Data was analysed thematically to identify key ideas and patterns (Braun & Clarke, 2006). This involved coding to descriptively categorised segments of data relevant to the research aims, comparing and contrasting codes to refine these categories, developing conceptual themes and then mapping the connections between themes to identify key patterns found within the data (Lester, Cho, & Lochmiller, 2020). Combining conceptual ideas and ideas found within the data, analysis moved from descriptive accounts to identify clear generalisable insights to inform understanding of how different phenomena interact (Gibbs, 2007).

First, interview and workshop transcripts and strategic priorities within strategic sustainability documents were coded using NVIVO software (widely used software used by social scientists for organising and sorting qualitative data). The first cycle of coding involved coding sections of data

relating to key topics relating to the key phenomena being explored in the study (e.g. the types of nature-based interventions, motivations for working with nature, factors influencing how interventions are planned and delivered, barriers and opportunities). These initial topics were closely related to the topics that had structured the interviews (Appendix 1 - Interview guide). The second cycle of coding involved disaggregating these to develop more specific codes and analytical categories. This was an iterative process and involved the development of analytical memos to refine labels and categorise to develop themes and sub themes. Two researchers were involved in this process – discussing and validating how codes were developed and refined throughout. For the document analysis (of strategic sustainability documents) thematic frameworks were developed. Connections between themes were explored through memo writing and by developing diagrammatic maps (using Miros software) (Ritchie, Ormston, McNaughton Nicholls, & Lewis, 2013).

4. Findings

There are four key areas of findings from this study: 1. The variation in how companies are currently involved in working with nature (what types of NbS are undertaken and how); 2. The different underlying motivations guiding the involvement of whisky producers in working with nature; 3. The multiple contextual factors that influence how environmental sustainability professionals within whisky companies work with nature; and 4. Ideas to strengthen uptake of NbS across the sector.

4.1 How and when do whisky producers in Scotland work with nature?

All but two interviewees identified ways their company is currently working with nature. Further analysis revealed variation in NbS undertaken by whisky companies in terms of the type of ecosystems, measures, land quality and tenure involved. There is also variation in how companies are working with nature, in terms of the roles undertaken by companies and how natural capital data is being used in relation to NbS.

4.1.1 Types of NbS interventions

Most companies involved in this study were already working with nature. These interventions encompass coastal, riverine, peatlands, woodland and terrestrial ecosystems and different types of ecological measures. Ecological measures in use across the sector include leaky barriers, buffer strips, bee hives, nesting boxes, fencing, tree/ hedge/ wildflower/ vegetation planting, habitat and species reinstatement (e.g. oyster beds and seagrass), wetland creation, pond management, invasive species management and alternative land management practices (e.g. cattle, geese and natural pest control). Some interviews also highlighted nature-based interventions that had not been successful, for example creating new wetland areas for improving water quality and for biodiversity.

The type of business model (e.g. the use of peat) and type of dependencies (e.g. water source) was highlighted by interviewees as a key consideration when deciding the type of NbS to undertake. Some large companies have initiated restoration programmes encompassing a portfolio of thematically linked ecosystem restoration and/ or challenge orientated projects, for example the Peatland Water Sanctuary programme developed by Suntory and a River Restoration programme being developed by Chivas. Ecosystem level interventions sought to improve natural processes and were predominately associated with large companies. Smaller whisky producers were mostly involved in smaller interventions whereas large whisky producers tend to focus efforts on larger scale NbS, although there are expectations.

"we've got a project going on…. [to] retain more water in our part of the land…[and to] let the (River) go back to where it used to be [before it was diverted]…and we're saying how can we get that back to a more natural

flow where the rivers are, you know, shaded with trees and there's more chance for spawning of, of species? So you know we have we have lamprey in our streams….so that that's an incredible species to have and I think it proves a lot about the purity of the water course….[we have protected our] local wood as a part of the site…. [and] a pond which has otters and herons and whatnot, so that's a good starting point. We've let that kind of rewild to some extent….On top of that, we've got areas which we have intervened, [for example] we just planted a hundred Scots Pines." (Participant A2)

We also identified variation in how land ownership affected NbS activity. Specifically, many companies preferred working on their own land, for example within distillery grounds or through an estate linked to the whisky company. Interviewees highlighted how working on company landholdings was better able to deliver staff wellbeing benefits and help strengthen working with nature as a norm at the site level. Companies also get involved in NbS on land owned by other actors (community or environmental non-government organisations), often with a less active role for companies (see section 4.1.2 on 'roles' below). For many companies land ownership was emphasised by many interviewees as an important **barrier**, due to the perceived difficulties of working with other landowners, hindering expansion of their nature-based interventions. Notwithstanding this, some companies are delivering (or seeking to deliver in the future) NbS with multiple other landowners. For example, Participant A4 have agreements for between 30-100 years with landowners to help maintain and safeguard NbS.

"[it] isn't as good as us owning the land, we've got a bit less flexibility…. [for example] there's a field which isn't ours between us and the river. So there is a bit of a buffer. If that weren't the case, it would be a different story in [terms of] Nature based Solutions and maybe a bit more of a priority…… [If] we don't own the land…then it becomes quite a complex administrative system negotiating with landowners to implement those sorts of things" (Participant A8).

4.1.2 Roles undertaken by companies in NbS

Our analysis also identified three broad role types that whisky companies undertake when involved in working with nature. These are: 1. Leading; 2. Partnering; and 3. Supporting.

A leading role involves companies designing and delivering nature-based interventions themselves. Within this role companies may interact with other actors, for example community groups to inform plans, yet for this role type companies ultimately decide the location and type of measures to be used. Interviewees highlighted this role as closely associated with interventions on land controlled by whisky companies (see section 4.1.1 above on the types of NbS interventions) and often involves multiple measures deployed and replicated over time.

A partnering role is where whisky companies work closely with other organisations to design and deliver NbS interventions. Interviewees highlighted these partners commonly involve environmental non-government organisations such as the RSPB, universities and research institutes and were considered a key dimension for planning and delivering ecosystem scale NbS (e.g. peatland restoration) (see section 4.1.1 above). Partnering is also starting to include multiple companies working together, for example for peat restoration on Islay involving four whisky companies. This partnering role often develops through shared (social/ecological) objectives and interviewees identified this role as beneficial for companies who may not have in house expertise (see section 4.3 below on what factors support or constrain NbS involvement) and for companies seeking more meaningful and widespread socio-economic impact from working with nature.

"A good example just now is we're looking at a project on Islay with regard to peat restoration. We're actually working within the Islay community, different organisations and just about to start later this year with other distillers regenerating peatland on the island" (Participant A10).

Lastly, Interviewees highlighted a common role for companies involved in nature-based interventions was a supporting role. This entails companies providing funding and/ or staff time to contribute to nature-based interventions led by other actors. Financial support was linked to long term NbS within and out with the UK, with interviewees emphasising that this role by companies enabled continued work by environment organisations, trusts and partnerships, for example fishery trusts and catchment partnerships. Providing staff time often entailed support for local projects and delivering specific measures such as tree planting.

"We….gave the money, I think it was about a hundred and 205a hundred and £50,000 for a peat restoration project…..[Furthermore we support] the Spey catchment initiative…. helping that work as a vehicle. We're not funding any specific projects… [our]selves but…..helping them financially with them keeping them going that allows this vehicle ….to operate better, to encourage more investment to it, to help it raise money in different ways, to align more of that kind of catchment level approach." (Participant A13).

Some companies did adopt multiple NbS roles. However those companies with organisational objectives explicitly orientated towards working with nature (see section 4.3.1) were more likely to adopt a partnering role. Further, when working with nature was not a distinct organisational objective these companies were more likely to adopt a supporting role.

4.1.3 Use of Natural capital data and tools

All participants interviewed recognised water, barley and peat (for some companies producing peated whisky) as key business assets necessary for whisky production. Furthermore, all highlighted the importance of data to inform investment decisions. However, the primary focus for data use within whisky companies relates to water, energy use and waste – aligning with an efficiency approach to environmental sustainability (see section 4.3.1 below). Many interviews did highlight ways they were using natural capital data, particularly in relation to hydrology (water quality, level and flow in terms of fluvial features and groundwater), soil (in terms of quality and quantity of peat substrate and soil quality for on-site barely production) and biodiversity (in terms of bird, mammal, invertebrate, plants and trees and habitat quality). A key **barrier** however highlighted by study participants is turning data into useable information and the time and expertise to enable this, particularly for smaller companies with fewer resources (see section 4.3).

"We had somebody come out and spend quite a lot of time noting every species that they could find, you know, over the course of a week of, of like bugs and plants….So taking that baseline data of what's living here…..but it's data, not information….we haven't converted any of that into usable biodiversity statistics or, or trends…it's a complete mess, but I don't know, how we would do that, how we find time to do that" (Participant A2).

Natural capital data may be collected on-site by companies, by working with public sector actors (e.g. NatureScot) or partners (e.g. from academia), or gathered and analysed by consultants. Some data collection tools were identified by companies, for example standard soil sampling kits, bioacoustics and wildlife cameras. Some interviewees identified the use of freely available datasets (e.g. SEPA water data) by companies and how their knowledge of the public sector (i.e. from prior roles) is helpful to know what natural capital data is available and from where.

Study participants identified multiple ways natural capital data is helpful. This included creating a baseline (e.g. tree distribution and health), understanding outcomes from NbS (e.g. increased bird numbers or soil quality), assessing the impact of business activities to ensure legal compliance (see section 4.2 below – motivations), for example water temperatures. Also, natural capital data was identified as useful to support the development of management plans (farm level management plans within the new Agri-Environment Climate Scheme and biodiversity plans), for achieving sustainability certifications (e.g. B-Corp, Association of Water Stewardship, Responsible Managed Peatland

Standard) and to understand future scenarios and business risk linked to the natural environment. Study participants highlighted the use of natural capital data for understanding challenges and trends in the sector and many highlighted a desire to understand how to better manage their natural capital.

"we need water and we are maybe fortunate in our production levels and so forth, but if someone's gonna say well we see in 20 years' time because of your catchment area, because of your issues up there, you're gonna have a problem, then not only would it be good to help the environment, but it would be good for us as well. So yeah, that's, that's absolutely something." (Participant A3)

Many interviewees emphasised the difficulty in identifying potential natural environment improvements as a **barrier** to achieving more NbS. However, some Companies were also using natural capital tools to help understand challenges and, to a lesser extent, understand opportunities to plan NbS. These included bespoke MS Excel spreadsheets (development in-house) aimed at managing compliance. For example, for abstraction, cooling water use, water temperatures and discharges back into the environment. Interviewees had also tried on-line tools but highlighted difficulties in interpreting outputs, paywall restrictions and a lack of transparency regarding underlying methodologies as **barriers** hindering their usefulness. Some companies have adopted the Environmental Management System aligned to ISO 14001 to monitor and review impact on biodiversity of company activities and across supply chains. Other tools in use identified by workshop participants included the map based JHI River Tool and the NatureScot Natural Capital Tool[3].

"There's lots of good information now. Some of its published by James Hutton called in an application called River Tool for example, that helps you identify locations where the river would benefit from enhanced connectivity to other habitats or planting for river temperature mitigation, for example." (Participant A9)

Furthermore, some interviewees highlighted the need for data to monitor and measure impact of nature-based interventions as a **barrier**. Some companies were however undertaking regular site - based ecological and hydrological audits to better understand how some aspects of natural capital were changing, to verify outcomes and to comply with licences.

In summary, within the Scotch whisky sector, those companies that are already working with nature often do so in multiple different ways – in terms of the types of measures, land and how they chose to achieve this (i.e the roles they undertake). Leadership and partnership roles are closely linked with the use of natural capital data for planning and monitoring NbS. Natural capital data is being collected by most companies to better understand current ecological and hydrological conditions. A few companies are also using natural capital tools. However, often the use of data and tools is driven by compliance challenges or for other business activities, with a limited selection of tools being used for planning nature-based solutions. Therefore, the current use of natural capital data by whisky companies does not necessarily lead companies to consider and develop NbS – natural capital data may be utilised for other means, for example to monitor compliance or to achieve certifications.

4.2 Why are whisky companies working with nature?

Interviewees who highlighted tangible ways their company works with nature emphasised the involvement of one or more motivations underlying these activities. Analysis identified six types of

[3] Since data collection NatureScot has released a beta version of a Nature Capital spatial tool that draws on existing natural capital data (https://www.nature.scot/doc/natural-capital-tool). This was shared with some companies at a Scotch Whisky Association event on working with nature in July 2026.

company motivations for working with nature. Often multiple motivations were linked to company involvement in nature-based interventions.

The different motivations identified by participants are detailed below.

Environmental policy and regulation motivation for working with nature entails action driven by the need to comply with licence conditions and potential changes to regulations, such as relating the use of chemicals. For example, some companies have created reedbeds and cooling ponds to improve the quality of water they return to the environment. Furthermore, a few companies are working within the landscape to help manage their ability to comply with licences, for example riparian planting to manage base temperatures in watercourses and leaky barriers to better manage water scarcity.

"I think where we perhaps have the strongest link with the sort of more natural environment things is actually around compliance, so, and probably particularly cooling water discharge compliance and maybe some water abstraction where, again, it's quite selfishly focused on we haven't got as much water as we want, how are we gonna get more water or, or we need to discharge our cooling water. How can we do that compliantly, where we might then harness natural solutions in order to achieve our own goal, but alongside that we would be having some kind of improvement on the, the sort of natural environment too" (Participant A13).

Despite a strong focus on addressing scope 1 and 2 emissions, and the requirement to address scope 3 emissions in the future, complying with climate change policy (e.g. offsetting) was not directly linked to working with nature, although the carbon sequestration benefits of some types of NbS were highlighted by interviewees. One interviewee also emphasised expected policy developments in terms of requirements for nature-related financial disclosures – highlighting a link to business resilience motivation. Also, highlighted were river basin management plans coordinated by SEPA (the environmental regulator in Scotland). Furthermore, policy pressure was also identified by some interviewees as an important lever for increasing the uptake of NbS in the sector. Environmental compliance thus focuses on meeting the requirements of regulators and public policy.

Enhancing **visitor and employee experience** was also a motivation for working with nature. This involved an emphasis on the importance of aesthetics in terms of shaping visitor perceptions and for supporting mental wellbeing of employees across company sites. Furthermore, active involvement of employees in delivering and managing NbS was recognised as an important outcome from some NbS in terms of employee health and in terms of helping to embed such practices as a company norm. This motivation was closely linked therefore to enhancing habitat and species (e.g. wildflower planting and nesting boxes) at distilleries and surrounding land owned by companies.

Interviewees also emphasised **customer and societal expectation** as a key motivation driving their work with nature. This relates to consumers (people buying whisky for themselves) and market intermediaries(e.g. distributors, wholesalers, food and drink retailers). This motivation was linked by interviewees to a wider trend observed by whisky producers of intermediary actors focusing more on products with strong sustainability credentials in relation to waste and net zero, and seeking evidence to ensure such claims are credible. This motivation is therefore closely linked to the desire to be ethical.

Specifically, some interviewees highlighted sustainability concerns as particularly pertinent to younger consumers. This motivation was also linked to the uptake of various certification schemes aimed at helping to convey a link between the production of whisky and sustainability, for example Water Stewardship and B-Corp. Interviewees however had varying views on the adoption of certifications schemes in terms of influence on consumer behaviour and the resources needed for to

implementation (see section 4.1.3 on natural capital data and on resources). In terms of working with nature, some interviewees highlighted greater potential to convey to consumers and stakeholders that companies are addressing sustainability concerns than technological solutions often adopted to reduce emissions. However, many interviewees also emphasised that they were not actively highlighting this work, with some suggesting concerns about risks of wider scrutiny and external critique of company sustainability issues and responses by companies. This led one interviewee to emphasis the type of nature-based interventions undertaken should be more closely linked to consumer expectations.

"my view is that where distilleries have done random nature-based solution projects that have not been very related to their business, it hasn't given them much marketing benefit. And I think people are aware of that because consumers can't associate drinking Glenmorangie with oysters in the sea. They just don't care and so there is no benefit. Whereas when you can tell a story that is directly related, and I think both Arbikie and NcNean do good jobs of that, as to how it's related to the product that you're selling, then consumers are engaged and then you get the marketing benefit.... the initiatives that sit behind it have to be linked to the product we're selling, not just any old nature-based solution in Scotland. If the company wants to get benefit, if they're just feeling charitable, then great. But I don't think most of the industry is in a position just to be charitable at the moment". (Participant A11, Workshop)

A further motivation linked to nature-based interventions highlighted by interviewees is **uniqueness and sector leadership**. This relates to a desire by companies to distinguish how they are working with nature compared to other companies in the sector to provide a competitive advantage. This focus on uniqueness was also viewed as essential within the sector in terms of finite company resources and to strengthen sector impact more broadly. This motivation also relates to a desire by companies to be seen as a leader in working with nature in the sector to help address sustainability concerns. However, sector leadership was also emphasised as involving knowledge sharing on what works across the sector - helping to reinforce the collaborative ethos within the sector between distillery sites that many interviewees highlighted as helpful for increasing the uptake of NbS (see section 4.4) and to demonstrate more widely how the sector is working to address sustainability concerns. This motivation is therefore often closely associated with larger companies and with marketing activities relating to 'customer and societal expectations' motivation.

"Chivas brothers, for example, they're doing energy and water….they're not leaning into peat, right….. They're doing some really good stuff on water and the collaboration on the Spey…so again, you have to pick your projects depending on your business imperative…..I'm not saying that we are the only people doing peatland (restoration) and we're a bit ahead. What we are finding though is we are pulling…other companies in so that's the benefit. And if somebody's over there is doing something [else]…. they'll pull people in that direction. We just don't have the resources to be across everything. As [with] all companies, we just need to pick our fights….then [be] willing to be an open book about it and share the learnings and make it a little bit more pain free for those who follow" (Participant A4).

A focus on **business-ecosystem resilience** was another motivation identified by interviews as informing strategic decisions on the type of NbS companies undertake (what measures and where). The focus is how ecosystems, in the context of climate change, influence the ability of companies to access key resources /water, barely, peat) to meet their production requirements in terms of quality and quantity.

"When we started to look how we implement that, we first looked at our catchments for our distilleries and it's quite clear that most of the water that we depend on from a quality and quantity point of view is coming from wetlands, primarily peatlands. So that started to get our head space into peatland restoration from a water point of view, but also business…..we actually consume peat. So peat has a double benefit for us." (Participant A4)

This motivation is therefore orientated more explicitly to proactive and landscape scale perspectives by companies. The type of business-ecosystem links was identified by interviewees as important in guiding this motivation, for example if water is sourced from a reservoir managed by Scottish Water, or from a bespoke spring. Interviewees emphasised that a focus on business- ecosystem resilience also creates outcomes useful for compliance and for reputational benefits (e.g. to align with societal expectations), whilst also being a key area for sector leadership. Therefore this can be viewed as an 'umbrella' motivation. While many interviewees acknowledged the importance of business-ecosystem links, very few identified ways they were actively working with nature to achieve this.

The final motivation for working with nature identified was **ethical leadership.** This motivation is moral and companies view themselves as being suited within the wider landscape with action is not necessarily driven by an explicit business need per se.

"this is the moral side of things really. We just want to make sure we're doing the right thing" (Participant A16)

Most interviewees from companies involved in NbS emphasised this as an important dimension of their work with nature. Furthermore, some interviewees emphasised this moral dimension as important to their role. Interviewees who emphasised this as an important motivation linked it to the leadership within the company. This motivation is particularly dominate for smaller, newer whisky companies. Interviewees also highlighted how this motivation deepened over time across the company as more work with nature was undertaken.

"I think to start with we were kind of doing things, not because of the word sustainability [but] because they were, it's that farmer Scottish way of making something out of something like what would be waste. So I think that was the driver initially and with time we were like oh that is actually being sustainable and yeah, so, but so now we're more conscious of it, I think. At the start we were just doing it because it was we thought it was….the, the cheapest way of doing something or whatever, you know? So, but now our driver is that it's the right thing to do" (Participant A14)

Table 2: Summary of the different business-related motivations for involvement in NbS

Type of motivation	Description	Core business dimension
1. Environmental policy and regulation	Action driven by the need to comply with licence conditions, potential changes to regulations and anticipated nature-related policy developments.	**Compliance**
2. Visitor and employee experience	Action driven by aesthetic and wellbeing benefits for visitors and employees	**Reputation**
3. Customer and societal expectation	Action driven by perceived pro-sustainability and pro-nature attitudes of consumers, intermediary market-based stakeholders and for certifications	**Reputation**
4. Uniqueness and sector leadership	Action driven by companies wishing to differentiate themselves (in terms of the type of NbS undertaken) and for leadership to support the sector	**Reputation**
5. Business-ecosystem resilience	Action driven by a focus on sustaining and enhancing the supply of key business resources linked to the natural environment and in the context of climate change	**Resilience**
6. Ethical leadership	Action driven by a moral imperative to protect and enhance nature	**Moral**

Interviewees also emphasised a lack of interest in carbon markets – suggesting a financial rate of return was not a well-established motivation for undertaking NbS within the sector or reputational concerns are hindering this.

Some motivations were more closely connected to certain types and scale of NbS. The visitor and employee experience motivation often involves on-site, small scale interventions focusing on

enhancing species and habitats. Landscape scale NbS are however more closely linked with three types of motivations – customer and societal expectation, uniqueness and sector leadership, and business-ecosystem resilience. The environmental policy and regulation and ethical leadership motivation are not directly linked to any type or scale of NbS – with other factors (see section 4.4) often hindering the ability to work beyond their own sites.

In summary, for those companies that are working with nature, the underlying motivations involved are diverse, often multiple and interconnected – involving compliance, reputation, resilience and moral dimensions. Resilience as a motivational category is often associated with NbS involving larger companies. Moral motivations are often more closely linked to smaller and newer companies and attributed to company leadership having a strong moral dimension towards the wider landscape. Reputational and resilience related motivations more explicitly position ecosystems in terms of the goods and services they provide as business assets – and this more closely aligned with a natural capital approach. Whereas compliance is all about managing direct links between business operations and the natural environment to reduce impact, resilience is a motivation with a more proactive orientation towards working at the landscape scale.

4.3 What factors support or constrain involvement in NbS?

Interviewees also emphasised the importance of context for informing their ability to work with nature. These involve multiple organisational, sector and external factors.

4.3.1 Organisational factors

Organisational factors identified involve the focus on nature within business objectives and structural factors that relate to the provision of dedicated resources (both human and financial), the skills and knowledge this entails, and decision-making processes for direct investment in specific nature-based interventions.

Business objectives for environmental sustainability

Interviewees highlighted the different types of objectives and therefore targets as an important factor guiding their involvement in NbS. Analysis identified five types of business objectives for environmental sustainability which have a varying focus on working with nature as a business activity.

1. Efficiency as a business objective focuses on seeking to reduce the amount of resources required to produce whisky, specifically water and energy. This objective aims to minimise as far as possible water related dependencies. Technological and infrastructure solutions are identified as core pillars to realise this (i.e. new buildings and equipment). This objective is widespread within the sector and does not reflect a natural capital framing to environmental sustainability. Some whisky companies have also changed their business models – reducing production in favour of a creating a higher quality product for market, for example Participant A3.

"We haven't got a shiny [strategic] document….but you know obviously we want to manufacture our product with the least impact on the environment. So one of the, the main focuses for us was actually reducing the amount of water that we need….so we've got limits that we follow and we've actually reduced the amount of water that we abstract by more than 50%... We've reduced the size of our cooling towers….and we've actually put temperature controls on the condensers so that we can actually balance cooling against water use and also against the impact on the quality of the whiskey …. So we've actually now got a really good system where we, we only abstract really what we need" (Participant A15)

2. Reducing negative impacts entails improving the quality of outputs from whisky production back into the environment (e.g. the quality and temperature of water) and reducing the impact of species and habitats. Small-scale nature-related (e.g. reedbeds and ponds), infrastructure projects (e.g. fish passes) and other sustainability initiatives, for example reducing packaging and using electric vehicles, are identified as ways to help realise this business objective. Some companies are also reducing their use of peat in whisky production. This type of objective is widespread within the sector and, in part, reflects a natural capital framing to environmental sustainability.

"As Scotland's leading independent Scotch Whisky company, operating in many global territories, [company name redacted] (Participant A16) is wholly committed to minimising the environmental impact of our operations…. We will become a net zero business….achieve zero waste to landfill from our own operations….minimise operational impact on any local ecosystems…treat and discharge processed wastewater responsibly" (Participant A16, Environmental Sustainability Guidance document).

3. Sustaining resource supply involves a focus on creating and securing the supply of goods and service as necessary resources in the production and sale of whisky. For example, this could involve ensuring the local and/ sustainable provision of energy, peat, barely, wood, cardboard for packaging and water. Peatland restoration, protection of natural water sources (i.e. springs) and woodland creation are considered relevant nature-related activities. Also involved are the use of alternative locally available packaging, onsite renewable energy production, sustainability certifications and on-site barley production. This objective is widespread within the sector and, in part, reflects a natural framing to environmental sustainability.

"We have made significant progress in ensuring that our wood is sustainably sourced with 100% of our sherry cask suppliers accredited with FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certification) certifications from 2022 onwards" (Participant A5, Sustainability Strategy 2024-2025).

4. Creating positive impact involves action beyond what's required to avoid and mitigate ecological losses, in order to produce additional social and/or ecological benefits. It often entails providing resources from the by-products of whisky production to support other local businesses. Related activities include by-products diverted to animal feed, species and habitat enhancement and ecosystem restoration (e.g. beehives, wildflower or tree planting, and peatland restoration) and organic/ regenerative farming practices (for in-house production of barley). For some companies this included a focus on action across the wider landscape.

"Sustainability is at the heart of everything we do at home and at work. We are proud members of the Galloway and Southern Ayrshire Biosphere, and feel that everywhere should be a earth-conscious as the Biospheres… We have budding partnerships with [name redacted] along with other environmental groups who are helping us maximise our land to benefit of nature." (Participant A2, sustainability webpage)

5. Nature enabling business diversification involves initiating or enabling new uses of nature that go beyond the pre-existing core business of whisky production. These activities include honey production, oyster harvesting, herbs and fruits for gin distilling, nature education, community event spaces and outdoor activities such as saunas and paddle boarding.

Table 3: Summary of environmental sustainability business objectives

Type of Environmental sustainability business objective	Type of actions identified as relevant	Participating companies?	Focus on working with nature as a business activity?

Efficiencies: Focuses on enhancing production processes to reduce the amount of water and energy required.	Infrastructure and technological solutions and shifting business models towards higher quality for the 'luxury market' and lower volumes (i.e. reducing production capacity)	All	No
Reducing negative impacts: Improving the quality of water (chemicals and temperature) and reducing emissions from business operations.	Holding ponds, reedbeds, riparian tree planting, reducing use of on farm chemicals, fish passes and electric vehicles. Also, shifts in business model to phase out brands of whisky relying on the use of peat.	All	In part
Sustainable supply: Creating and securing the local supply of goods and services from ecosystems, for example wood and water.	Alterative packaging, onsite renewable energy, woodland creation and management (for biomass energy and wooden casks), on site growing (barley) and protection of natural water sources (i.e. springs).	All	In part
Creating positive impact: Providing resources for local businesses within other sectors and contributing to an increase in biodiversity.	By-products diverted to animal feed, species and habitat enhancement and ecosystem restoration (e.g. beehives, wildflower or tree planting, and peatland restoration) and organic/ regenerative farming practices (for in-house production of barley).	All	Yes
Nature for new business activities: New business activities developed to supplement/ complement the production of whisky.	Honey production, oyster harvesting, nature education, community events and outdoor activities.	Some small companies	Yes

Most companies involved in this study adopt multiple objectives as part of their overall environmental sustainability aspirations. Objective 1 and 2 were widespread and thus often found together. Larger companies often set out multiple types of objectives in their sustainability strategies. Objective 5 which involves a focus on working with nature for business diversification is not widespread, being predominantly linked to an environmental sustainability focus by smaller whisky production companies, for example Participants A2, A11 and A10.

In summary, some companies are more focused on objectives more orientated to technological solutions, whereas others have a more explicit focus on working with nature – thus reflecting more clearly a natural capital way of thinking.

Organisational structures and processes

While some companies had dedicated sustainability teams, other companies' sustainability responsibilities are bundled together within a single role – particularly in smaller companies. Some interviewees also highlighted that some of these roles had been recently created. The type of skills and knowledge within companies for planning and delivering NbS therefore varies. This was emphasised as important by interviewees as it informs if and what types of NbS are considered and delivered.

"Probably just skills and knowledge, understanding, things like that. Especially in a company this size, we're only just getting to the point where we're taking on someone to do our own sustainability stuff. Yeah, it's pretty unfathomable to have somebody dedicated to doing those more nature Based solutions cause I don't come

from an environmental engineering or an ecology background so completely out of my skill set… Certainly for us or for me, one of the big challenges for those sort of things is ingrained ways of working" (Participant A8)

Skills and knowledge of sustainability personnel was also identified as a key internal factor influencing the uptake of natural capital data and tools (see section 4.1.3) to inform NbS planning and to provide evidence of actual/ potential impact. Many interviewees highlighted the use of consultants to help address these skills and knowledge gaps, whereas others emphasised the role of partnerships (see section 4.4.2) and analytical support received from the Scotch Whisky Association (SWA).

Many interviewees also highlighted the importance of available financial resources for investing in the planning and delivery of NbS. Budgets and their timeframe (e.g. annual or longer) were identified as an important factor in planning nature-based interventions but also the ability to access these, which could require a business case submitted to a different part of the organisation. While some interviewees highlighted a large budget and autonomy in how it is spent within their NbS programmes, other interviewees highlighted a lack of autonomy as a **barrier**, particularly for responding to new opportunities.

"We tend to look at these projects on a case-by-case basis as they, they come to us. And if we can secure the funding. Securing funding is quite a difficult thing to do unless we can, provide evidence of payback for the business…..we do have to put in a business case and, our, our financing is such that budgets are set in around April for the following financial year…. So, if you know in advance something's coming, you can bid for that in the budget. But if somebody comes to you like during a year we got this great project, but we'd need £10,000 now, that's actually very difficult for us". (Participant A13).

Interviewees from smaller companies emphasised that larger companies had the financial resources to be more innovative, whereas small companies had fewer resources and thus there was a need for greater certainty in terms of the interventions taken forward. Some of these smaller companies also highlighted an important role for grants to help bridge the gap between their aspirations and resources. At the same time, the less complex decision-making processes in smaller companies was identified as helpful, enabling these companies to be more responsive.

4.3.2 Sector specific and external factors

Sector-specific factors identified by interviews mainly focused on a strong collaborative ethos within the sector, supported by the Scottish Whisky Association (SWA) working groups, geographical concentrations of distilleries, for example within the Speyside region. Furthermore, many interviewees emphasised how the sector had embraced sustainability in terms of climate change and emissions which for some working with nature has followed, whereas for other companies the investment needed for climate change action has led to a more cautious approach to investing in nature.

External factors identified relate the willingness of other public sector actors to enable companies to strengthen social-economic outcomes of working with nature and the wider institutional arrangements involved. This related to a perceived tension between public sector requirements and commercial reality, viewed as particularly challenging for smaller companies. Despite the direct experience of water scarcity by many companies and the desire to sustain operations in warmer months to comply with abstraction licences, discussions with regulators about NbS, particularly across the landscape, were uncommon. Instead, environmental NGOs with a focus on nature outcomes were identified as more active in exploring such ideas (see section 4.4.2 on partnering). Examples of the public sector requiring nature-based interventions (e.g. raingardens to slow the flow

of water into nearby watercourses and species and habitat measures near SSSIs) were identified by interviewees – but some interviewees were confused about why they were required and their added value.

Some interviewees from small whisky producing companies highlighted wider institutional arrangements and practices within the public sector as a **barrier** to their ability to develop NbS as part of a wider business strategy and to deliver wider public goods. High taxes on smaller businesses and market pressure were also identified by interviews as factors influencing their ability to invest in nature-based interventions. This was reiterated by workshop participants who highlighted a lack of understanding of the term 'natural capital' as a challenge within the public sector.

> *"We're looking at different options, but we're really, we're struggling at the moment because sales have dropped through the floor and, and we've basically the money we've got is really just for keeping process going" (Participant A15).*

In summary, organisational, sector-wider and broader institutional factors intersect to guide if and how companies are willing and able to get involved in working with nature. Internal skills and knowledge and resources are important, yet companies have developed ways of overcoming these gaps by working with other actors. Furthermore, the collaborative ethos across the sector is also helpful, particularly where there are geographical concentrations of companies. However, some public sector organisations seem to have limited understanding at an operational level of a natural capital approach in a business context, leading to a perceived imbalance between nature goals and commercial reality.

4.4 What might further strengthen whisky producer involvement in NbS?

Interviewees and workshop participants identified ideas to support greater uptake of NbS within the sector. In total 18 were identified, which are organised into 3 overarching themes: 1. Increasing understanding of nature as a business solution; 2. Supporting NbS planning and delivery; and 3. Supporting more ambitious NbS (Figure 2). Many of these ideas were identified by whisky companies themselves. These often focused on how to strengthen direct support for companies in terms of financial resources and skills for smaller companies, and more generally to increase knowledge exchange and to draw attention to NbS as a relevant business activity across the sector, including across supply chains. Furthermore, sector representatives highlighted how NbS could help convey how the sector contributes to wider public good. Intermediary organisations participating in the workshop provided additional ideas, often focusing on ideas to help bring to the fore the benefits to business by working with nature and in the context of climate change to increase business resilience. Intermediary organisations also provided ideas to help increase the uptake of natural capital tools and for supporting more collaborative working within the sector and across sectors.

4.4.1 Increasing understanding of nature as a business solution

The whisky sector is diverse with whisky producers adopting different business strategies and business models. There are examples of whisky producers working with nature within the wider landscape linked to multiple business objectives. However, some interviewees highlighted limited or non-uptake of NbS due to a lack of awareness and knowledge needed to consider NbS. This led participants to identify ideas on how to increase awareness and knowledge of NbS across the sector.

1. Share examples of NbS that have worked/ not worked. Examples are important to illustrate how the sector is already working with nature and the benefits this entails. Interviewees also highlighted examples of ecological measures that have been tried by companies that have not worked well, for

example creating reedbeds and other wetland features. Interviewees emphasised how sharing examples can help learning within the sector. Furthermore, intermediary organisations who participated in the workshop in April 2026 highlighted the provision of information on the different business benefits involved, resources involved in delivering each intervention and if not successful, why?

"So I think it is important…if there are some case-based approaches that have been taken that can actually be presented as evidence that would help you know, businesses and organisations show more interest in it." (Participant B3, workshop)

2. Compare and contrast grey infrastructure solutions with NbS. Some whisky company interviewees highlighted how traditional engineering solutions (e.g. reliance of grey infrastructure) often dominate decision making – and NbS may not be considered at all. There is therefore a need to present NbS as an alternative option, highlighting how this differs from more traditional ideas and activities and the added benefits that NbS could provide.

3. Make more use of a 'business resilience' framing to more explicitly highlight the relevance of working with nature for whisky producers. A more explicit use of a business resilience framing was emphasised by intermediary organisations as particularly useful to signal the relevance of NbS for the sector, for example in terms of water scarcity and other climate adaptation related challenges. This helps signal nature as a useful risk mitigation strategy. Workshop participants also suggested that NbS could be included as a fixed agenda item for all of the SWA working group meetings to help embed the idea better in the sector. Some interviewees also suggested a new SWA working group for NbS.

"Someone mentioned earlier sort of a risk-based approach and how that can actually affect the business, because we know I mean…these are major issues for businesses over the long term, but getting that message across to leadership is tricky and I think that's essentially a knowledge issue" (Participant A8, workshop)

4. Draw attention to NbS public and private goods and how these can be enhanced. Many NbS within the sector also deliver public goods alongside business benefits – and often these are inherently linked. For example, a few newly established, smaller whisky producers are working with nature as a core part of their business strategy which can include community building dimensions such as new recreation facilitates for health and wellbeing and new spaces for community gatherings. Larger companies are also explicitly focusing on delivering more strategic public goods as part of their NbS activities. For example, focusing on peatland sites too degraded for public funding from Peatland Action and focusing on working with the scientific community to strengthen knowledge on what works and why. Large companies working at a landscape scale often have an explicit focus on contributing wider benefits, for the sector and beyond. Representatives from the Scottish Whisky Association in the April 2026 workshop highlighted therefore how NbS demonstrates one way the sector is contributing to public good.

5. Increase awareness of how NbS can build supply chain resilience and the value added. This study focused on how companies themselves are working with nature, not how they are influencing other supply chain actors to work with nature to increase business resilience. Workshop participants however highlighted this as an important consideration for whisky companies, and some companies emphasised they were starting to explore this. Awareness of the opportunities to achieve this could be helpful for other companies seeking ways to increase supply chain resilience and other benefits from working with nature.

"So we've worked a lot in the cereals working group, trying to develop guidance and support for companies working with a supply chain. So they're looking for on-farm practices to change and what are those outcomes and impacts? You really have to have a very robust, you know, data platform or your monitoring and reporting verification systems. And those can be hard to navigate." (Participant B4, workshop)

6. Share insights on sustainability tools from other countries that could support NbS uptake. Some business sectors in other countries have a strong focus on environmental sustainability, for example Scandinavian countries with similar political and cultural contexts. One whisky company highlighted how they were starting to trial different tools for supporting sustainability decisions used in other countries (e.g. company sustainability audits which are more common in Scandinavian countries). A focus on identifying useful tools and practices from other countries with a similar cultural and political context could therefore help identify additional ways to strengthen environmental sustainability action within the scotch whisky sector.

4.4.2 Supporting NbS planning and delivery

7. Support the use of natural capital framings in company sustainability strategies. Some companies focus predominantly on technological solutions for more efficient water and energy use, and may overlook the potential to work with nature as a business asset. Strategic objectives are important (particularly formal strategic documents) as these inform business targets. Operational sustainability roles seeking to work with nature within these companies may struggle to develop a business case for doing so beyond small interventions (e.g. within a distillery site or through funding for community environmental projects). Intermediary organisations therefore suggested targeting executive level business actors who define business strategies in order to strengthen a natural capital perspective in company strategies.

"Trying to petition to leadership to engage with them on these issues, I've only got so much I can give to them before they either lose interest or they're too busy to do something else. So like your scope 1 and 2 emissions have been top of the agenda. So there's been sort of limited room for me to really, you know, encourage the leadership to look more at nature-based solutions." (Participant A8, workshop)

8. Targeted financial resources to support small companies lead NbS. Interviewees from smaller companies emphasised how the lack of resources is a barrier for them to expand beyond small-scale measures (e.g. planting, nesting boxes, bees hives and ponds). This differs from larger companies who as a business have more resources (financial and human) to utilise for innovation and pursuing multiple types of NbS together. This led workshop participants to identify the need for public sector funding to support NbS planning and all this requires – creating a hybrid funding model for smaller whisky producers to better enable them to turn their willingness to work with nature into practice and reduce risk.

9. Increase knowledge on useful NC tools and data for the sector. Intermediary organisations identified a need to increase awareness in the sector on what NC tools and data could help companies plan NbS interventions. Furthermore, highlighting tools and data already used in the sector could also be useful, for example some companies highlighted their use of Environmental Management Systems aligned with ISO 14001 and their use of iNaturalist UK to monitor species on their sites. Intermediary organisations also identified tools that could be useful to companies to better understand challenges and for planning NbS. For example, the Climate Risk and Opportunity Assessment developed by Highlands Adapts, the Riverwoods tool; Digital centre of excellence and Zora Ecosystem natural capital platform. Providing information for whisky companies on which tools are useful for business and how was therefore identified as helpful by workshop participants.

"You're going to need a package of tools, because my critical thing about that is it's kind of trying to do everything. And that's great to assess the wider things. But when you're getting down to the specifics, I need to look at a tool that gives me more water resilience in the catchment. That tool won't do it. You need a tool that allows you to basically locate a measure and how to build it. So you need a different set of tools. What you need is a directory of the tools that's going on". (Participant B2, workshop)

10. Continue analytical support for small companies to turn natural capital data into useable information. Natural capital data can be in different forms and the time and skills required to turn this into useable information can be limited, particularly in smaller companies. This led one interviewee to highlight the importance of analytical support provided by SWA that had in the past enabled this company to use data they had collected to better inform their environmental sustainability decisions. Continuing to provide analytical support to smaller companies was therefore identified as helpful to better turn business aspirations into reality.

"We make a lot of decisions, you know, shooting from the hip rather than gathering the right data, even knowing where to go and gather that data from and how to, how to turn that data into usable information for us. So, so we, we I certainly struggle with that" (Participant A2, workshop)

11. Use a place-based approach to turn natural capital data into useable information for companies. Workshop participants emphasised that despite availability of natural capital data, this data needs to be translated into information to be useful in decision making. One idea provided by intermediary organisations to support this is a place-based approach. For example, Highlands Adapts have produced climate risk maps for the Highlands, regional enterprise agencies are incorporating a natural capital approach into their activities and pioneer catchment partnerships are being established to support landscape restoration. A focus on key whisky regions, such as Speyside, was highlighted as particular relevant for the sector to help companies collectively understand challenges and future trends. This approach however needs to also include a focus on understanding how working with nature could enable companies to better address such challenges.

12. Explore links between environmental sustainability certifications, natural capital data and NbS for addressing environmental sustainability challenges. Some interviewees identified environmental sustainability certifications as being data driven, and thus helpful to develop skills and knowledge for working with data – which was identified by some interviewees as a barrier to the use of natural capital data and tools. Certifications vary in how they promote a natural capital approach. Examining the role of certifications in a natural capital approach could be useful therefore for understanding which require a NC approach and which are more or less prescriptive.

13. Develop sector natural capital baseline and standardised metrics for measuring progress. Developing natural capital metrics and baseline for the sector was also identified as useful by some interviewees which have help to credibly demonstrate progress. This could also increase confidence to strengthen reputational benefits, which in part already drive some companies to work with nature (e.g. in terms of customer and societal expectations – see section 4.2).

4.4.3 Supporting landscape scale NbS

14. Develop a sector fund for NbS. Some interviewees from larger whisky companies also highlighted that despite large companies having more business resources, these resources may not be directed towards NbS as a business resilience building strategy. This led one workshop participant from a regional enterprise agency to suggest the sector introduce a premium on international sales to fund NbS in Scotland.

15. Scottish Government to consider a water tax to fund NbS. One interviewee from a larger whisky company undertaking landscape scale NBS suggested a Scottish water tax could provide a mechanism to develop a fund for NbS for addressing water related challenges. This tax could apply to multiple economic sectors and be a core foundation of a hybrid funding model (see idea mentioned above in section 4.4.2) and reduce industry concerns about losing a competitive advantage from any investments at the landscape scale they pursue. The fund could also be explictly linked to the provision of public good via NbS, which are more likely at a landscape scale. In addition, this funding mechanism could support the development of collaborations between businesses, for example involving multiple small whisky producers and across sectors (e.g. whisky producers and farmers/ landowners).

16. Coordinate place-based business-to-business collaborations. Interviewees highlighted a strong collaborative ethos within the sector (see section 4.3.2) that is helpful for sharing knowledge. Further, while NbS collaborations between whisky producers are rare, there are examples involving small whisky companies (i.e. restoring peatland on Islay). This led one workshop participant from an intermediary organisation highlighting the benefits of place-based collaborations for achieving landscape scale NbS, for example involving multiple whisky producers in Speyside. How to achieve this may need to be explored further as NbS was emphasised by some interviewees as one way larger companies may seek competitive advantage. However, on Islay smaller whisky companies, working with an intermediary, are partnering to restore a peatland.

"So you can take a different angle, you can try and collaborate, or you can be focused on self-sufficiency, I won't say selfishness, but self-sufficiency, and just look after your patch." (Participant A9, workshop)

Workshop participants from intermediary organisations also highlighted an opportunity for achieving landscape scale NbS through cross sector collaborations, for example with farmers who also experience similar challenges such as water scarcity and thus will also benefit from NbS. One example highlighted was the Landscape Enterprise Networks (LENs) which could be adopted more widely by whisky producers to help organise NbS beyond their own land holdings, helping overcome the barrier to NbS of working with landowners identified by multiple interviewees. One workshop participant also highted the introduction of pioneer catchments (the Dee and the South Esk catchments) as place-based opportunity for improving cross sector working and for accessing funding.

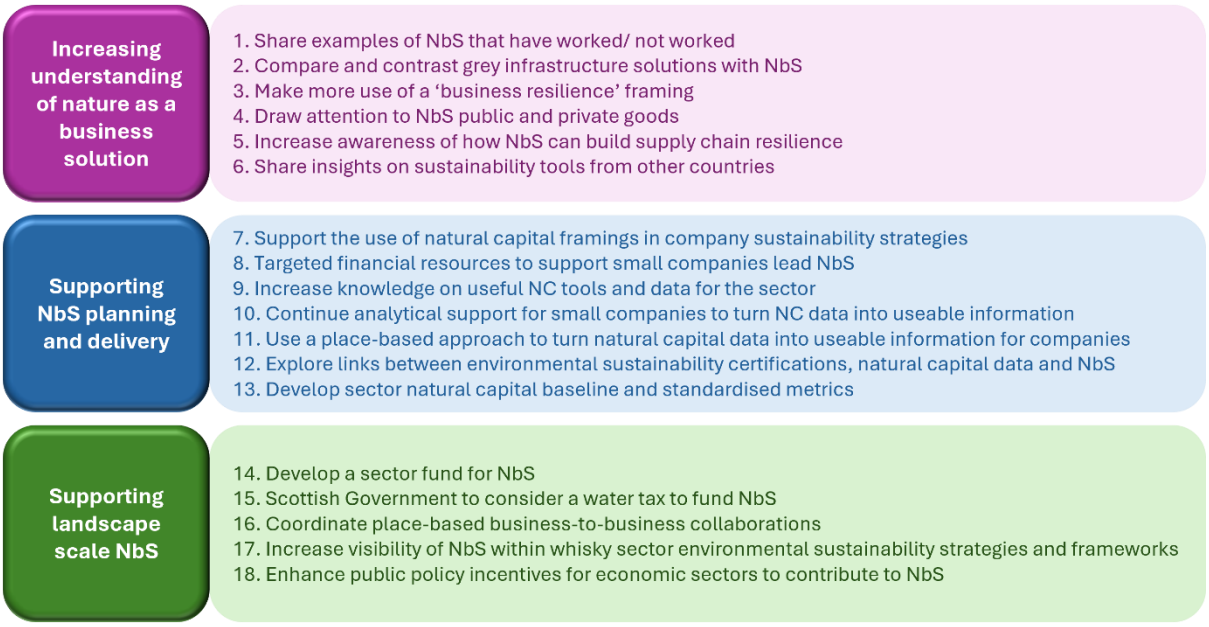
17. Increase visibility of NbS within whisky sector environmental sustainability strategies and frameworks. Interviewees emphasised that as an industry organisation the SWA is well regarded by whisky producers, for example focused working groups and inclusion of smaller whisky companies. One interviewee highlighted an opportunity for the sector to have a more explicit focus on NbS in its strategies and frameworks - providing more prominence of NbS as a business activity with multiple benefits. Since data collection, the SWA has begun to develop sector guidance to bring more to the fore the potential added business value from NbS within the sector (see Box 1).

18. Enhance public policy incentives for economic sectors to contribute to NbS. Interviewees identified policy frameworks as important to inform business activities across supply chains. This led some interviewees to identify policy changes that could be useful to better incentivise the whisky sector (and other economic sectors potentially) to pursue NbS. This included the suggestion for a Biodiversity Net Gain policy in Scotland to create a funding mechanism to help fund NbS, to better enable more leadership of NbS and to support more landscape scale NbS. Further, the need for a Scottish government policy on increasing climate resilience and sustainability across supply chains was also identified as an opportunity by one interviewee to help leverage greater uptake of NbS.

Also, another interviewee highlighted how public policy incentives have helped increase activity to reduce waste due to the increased costs incurred. The potential to engage with existing and emerging nature markets was not identified as positive financial incentives for delivering NbS.

"So it's not just about private sector paying for all, it's public sector and working across multiple agencies." (Participant B2)

Figure 2: Summary of ideas to strengthen whisky producers involvement in NbS



In summary, study participants identified ideas to strengthen a NC approach in the sector by providing more targeted information which more explicitly draw on 'nature as a business asset' framings (e.g. as a risk mitigation strategy for building business resilience). To improve the link between natural capital as a way of thinking within companies and NbS as a way of acting by companies (i.e. as a business activity across the sector), participants also highlighted ways to improve access to and skills for working with natural capital data and tools to better enable sustainability teams to develop business cases for NbS. This included recognition of the need to influence and improve the focus on NbS in company sustainability strategies, the importance of a place-based approaches to improve natural capital information and to organise collaborations within and across the sector, and the need to provide support for smaller whisky producers. Public policies were also identified as important to develop mechanisms to better enable uptake of NbS in the sector – ideas that are also potentially relevant to other economic sectors.

5. Discussion

This study examined when, why and how companies are working with nature and how this could be further strengthened in future.

Our first pair of research questions were: How do whisky companies get involved in activities related to NbS?; and Why do they get involved? This study shows that in 2025 many - albeit not all - whisky companies are involved in working with nature, in diverse ways that range from peatland restoration to coastal habitat creation and wildflower planting. Their roles in these activities range from partnering (especially at larger scales) to leading and supporting. The reasons why companies are

involved are diverse range of reasons, ranging from a desire to safeguard core operations (e.g. to safeguard water supply) through to reputational reasons (a desire to bolster brand) or even moral (to deliver broader public benefits). Interestingly, our sample did not include carbon market engagement for profit as a motivation. Of course, these motivations are not mutually exclusive, and representatives from some companies report there can be multiple. Larger companies have so far been more involved in partnering and large-scale landscape planning but there are signs that smaller companies may be starting to also engage with this, e.g. for peatland restoration. Smaller companies are also at times more innovative in their business diversification strategies to work with nature.

Our second pair of research questions focused on Natural Capital: do these framings, tools or data play a role in whisky producer involvement in NbS? We found Natural capital tools and data are being applied within the sector to understand current conditions and to understand change over time, yet use of these types of tools for planning NbS is currently limited. At a more conceptual or strategic level, a natural capital framing is used by some businesses – where nature is explicitly recognised as a business asset supporting new and/ or existing business activities – albeit not always reported in precisely those terms. Taking a natural capital approach entails attention to dependencies on nature, and impacts on nature, and this was reflected in some business objectives. Some objectives were concerned with reducing the amount of resources used, and/or with reducing the impact of doing so, often involving technological solutions. The ability to plan and deliver NbS is influenced by other factors, both internal and external to a company. Organisational factors include dedicated sustainability roles and available financial resources. The skills and knowledge within sustainability teams is also important – although some companies work with consultants and partner with other actors (e.g. environmental NGOs and research organisations) to overcome this barrier. Access to data, the relevance of tools and skills to use these to inform NbS planning are also important factors in enable companies to better operationalise a natural capital framing via NbS. External factors include availability of frameworks and support for collaboration or partnership working, and also perceived responsibilities. For example, Scottish Water was identified by one company as responsible for sustaining their water supply.

Our participants identified multiple opportunities that could help strengthen the uptake of NbS across the sector, presented as 18 ideas in section 4.4. Importantly, the whisky sector was seen as well placed to develop action in the area further, as participants highlighted a strong collaborative ethos within the sector and strong support from sector representatives on sustainability issues. Additionally, larger companies seem to recognise a pioneer or demonstrator role for the sector as a whole. The need to tailor support for smaller companies with less human and financial resources was also highlighted. The development of Landscape Enterprise Networks (LENS) and other initiatives for collaboration at the landscape scale should consider how to balance the capacities and needs of small and large organisations to maximise who is enrolled in NbS planning and delivery. No one single idea or actor can bring about wider uptake of NbS across the sector – a joined-up approach is essential.

Limitations

As we earlier discussed in Carmen, Waylen, and Gray (2025) there are a number of limitations for this study. In terms of study participants, one person from each company was interviewed. Whilst this approach is likely to be sufficient to gain a good overview of company aims and activities in relation to environmental sustainability and nature-related activities in terms of smaller sized companies, caution is needed when interpreting findings in terms of larger whisky companies. Furthermore, while recruitment sought individuals whose role focused on sustainability, in some

companies responsibility and expertise relating to environmental sustainability may be dispersed across levels and departments, particularly within large multinational companies, so it is possible we have not accounted for all NbS activities, motivations, data and tools use or other factors shaping NbS engagement. Conversely, those who chose to participate in this study are most likely to be those with a prior interest or involvement in sustainability and nature-related activities, However, to counter this self-selection challenge, during recruitment we strove to emphasise that all views and experiences were welcome, and we were able to secure participation from two individuals whose company did claim to have any prior track record in NbS. Inevitably though, this study provides fewer insights about companies who choose not to undertake any nature-related activities.

The findings of this study have implications for research, for business actors and their representatives within the sector, and for the public sector).

Implications for research

The business and environmental sustainability literature is dominated by a focus on business engagement with climate change, often explored through corporate sustainability reporting and formalised sustainability strategies. A focus on how and when businesses work with nature is increasing (e.g. see Krause, Droste, & Matzdorf, 2021), including a focus on biodiversity net positive targets (de Silva, Regan, Pollard, & Addison, 2019), yet the focus is often on large corporations (e.g. Wagner, 2022). This study provides a useful complement, by exploring small and large businesses within one sector. A strong and weak sustainability conceptual lens is adopted within this business and environmental sustainability literature, helping to highlight the spectrum of goals and outcomes from business activities (e.g. Shourkaei, 2025). The findings of this study suggest adoption of natural capital framings as a dimension of business sustainability strategies can also be better understood as a spectrum in terms of the level of integration of nature and the intentions involved.

Further, while underlying motivations are explored, identifying compliance, financial and reputational (Kitsios et al., 2020), marketing, culture, leadership and moral factors, insights from business and sustainability literature highlight the (legal) compliance as the dominant driver (Manninen & Huiskonen, 2022). Ethical or moral dimensions do however tend to also underpin greater uptake of sustainability within small and medium sized businesses (Bonilla-Priego, Nájera-Sánchez, & Font, 2022; Luederitz et al., 2023). This study reinforces these insights, highlighting the diverse and overlapping business motivations also involved in business decisions to work with nature, and also emphasising business resilience as a core motivation. Motivations are however identified as insufficient for strengthening sustainability goals and practices, with multiple factors also highlighted in the business and sustainability literature as hindering sustainability practices.

Attention to the role of business in the biodiversity governance literature has been growing. This includes a natural capital lens and assessing business impacts and dependencies (Trim & Jones, 2025) and mobilising finance for nature recovery (Hoekstra, 2022). There is also an emerging area of research on mainstreaming Nature-based Solutions which includes a focus on institutional barriers, including the engagement of the private sector (Dorst et al., 2022). In relation, motivations are implicit via a focus on multiple socio-economic and biodiversity benefits. By exploring underlying motivations in initiating NbS, this study provides a wider perspective beyond operational dimensions directly linked to ecosystem services by bringing together operational, compliance, moral and reputational motivations and as 'bundles' of motivations. The findings of this study also re-emphasise the importance of collaboration for deeper and broader adoption of a natural capital framing across the sector and to increase involvement in NbS by business actors – which is recognised as key factors in the biodiversity governance literature and the business and

environmental sustainability literature. However, this study highlights a multi-directional conceptual relationship and multiple practical entry points to support mainstreaming of NbS within organisations and across the sector, including across organisational hierarchies and levels of governance. Specifically future research linked to this study could entail;

1. **Exploring how perceived business responsibilities, partnership working and business (human) agency interact within the whisky sector to guide Nbs decision making**
   Ability to act is a key dimension to understand pathways for operationalising NC framings. Organisations are complex, embedded systems within wider landscapes and institutional arrangements. This study suggests partnership working can overcome internal constraints but how and why these emerge needs to be better understood.
2. **Exploring, using a triple loop learning conceptual lens, opportunities and barriers for increasing the uptake of Nbs within an economic sector, e.g. the whisky sector**
   Knowledge about NbS as a useful business activity is piecemeal within the sector – some interviewees were unaware of this as an idea. Other interviewees were aware of the idea but had limited knowledge about how to influence business investment decisions (e.g. build a business case). There are examples of different types and scale of NbS being adopted in the Sector and there is a strong collaborative ethos between distillery sites. Research could help to better understand how collaborative norms and informal networks facilitate learning about NbS and how can this contribute to NBS mainstreaming within the sector.
3. **Supply chains.** The scope of this study was whisky producing companies but some participants also highlighted how their supply chains affected this, for example their barley inputs come from farmers growing barley, accepted and processed by barley maltsters and processing companies. A supply chain focus was beyond the scope of this study but would be relevant for future work (both for whisky but potentially also when studying other sectors).
4. **Exploring barriers and opportunities for adopting a NC framing and how consultants and partnership working influence this.**
   Use of NC data and tools can inform business understanding of dependencies and potential business opportunities, however often companies use consultants to undertake such assessments and identify solutions. This external pathway has potential implications for internal business capacity (skills and knowledge). There is a need to better understand how companies can work with consultants to increase capacity to improve their ability to act in ways that support wider adoption of NbS (i.e. going beyond single NbS measures in 'special' situations) within business settings.
5. **Clarifying the conceptual relationships between Natural Capital and Nature-based Solutions**
   This study reveals some key connections between these concepts, showing multiple connections and helping to go beyond a simplistic data and information deficit' relationship. Further conceptual development could increase understanding of different entry points for change, increasing the potential impact on policy and practice from future NbS governance research.

Implications for business actors and their representatives within the Scotch Whisky sector

The findings of this study bring to the fore existing ways the sector is engaging with nature and how, in terms of individual companies and in terms the activities of sector representatives such as the Scotch Whisky Association (SWA). This study also highlights key features of the sector which support

knowledge development and sharing. Specifically, there are established working groups and informal 'learning' networks within the sector which could be better mobilised for knowledge sharing.

Crucially, to support greater uptake of natural capital framings and to achieve more ambitious NbS these existing pathways need to explicitly help develop understanding within the sector about 1. key principles of NbS; 2. the different types and scale of NbS that could be relevant; 3. why companies are/ should adopt such activities; and 4. How companies can get involved and contribute to improving sustainability in the sector by working with nature. For example, guidance could clearly set out the links between landscape scale NbS and how these can support different types of business activities.

Particularly, the sector could support the development of formalised collaborations between companies and across sectors, perhaps through a place-based approach. A focus on shared challenges within a landscape could provide 'common ground' for fostering early dialogue to bring different actors together. Trialling processes intended to support cross-sectoral landscape collaborations such as LENS is important, whilst not expecting that 'one size fits all', as whisky companies are diverse in their settings and operations. However, formalised processes, frameworks and other institutional mechanisms will be important to structure and guide the development of effective collaborative arrangements that deliver benefits for those involved over time. The sector could consider how to encourage other actors to work with it in partnership to overcome skills and knowledge gaps, and to unlock additional financial resources – particularly to support smaller companies. Furthermore, knowledge about natural capital data and tools, and skills to apply these to inform business decisions could be improved across the sector. A starting point is to explore existing resources, such as those from the Capitals Coalition, which are intended to provide processes and tools that support businesses to work with natural capital.

Implications for public sector and policy

The findings from this study highlight wider institutional arrangements and practices of public sector organisations as influencing whisky producers' engagement with NbS. This includes organisations with a regulatory role, for example local authorities, SEPA and NatureScot. Specifically, some in the sector view a lack of business understanding in public sector decisions as a barrier to whisky companies' ability to work with nature in more innovative and context sensitive ways. For example, licencing decisions that limit the social value added by smaller, newer companies that have sustainability as a core dimension of their business models. Further examples include conditions for small scale NbS for SEPA water licencing and NatureScot requirements for biodiversity enhancements near protected conversation sites where business benefits beyond compliance are unclear. This suggests a greater focus on both private and public NbS benefits in public sector decisions could be helpful to support more joined up decisions underpinned by a natural capital framing.

Further insights from this study identify a lack of financial resources and risk associated with trailing NbS as a barrier for smaller whisky producers. Public sector organisations such as NatureScot could therefore consider seed funding for small enterprises to reduce risk, and potentially incentivise the development of partnerships to help support more ambitious action.

Study insights also highlight the importance of partnership working to access knowledge, skills and resources and for developing landscape scale NbS. Public sector organisations, such as the Highlands and Islands Enterprise Agency and the Southern Scotland Enterprise Agency are already seeking to support the uptake of natural capital framings across sectors and can continue to support this. It may be useful to especially target smaller companies. In this study, many newly established smaller

whisky producers have embedded a commitment to sustainability as part of their business models orientated towards creating positive socio-ecological impact within the surrounding landscape including seeking benefits for local communities (i.e. a prosocial dimension as core to their business model). This highlights how these holistic business models involving a commitment to more sophisticated approaches to NbS by small business can potentially support socio-economic policies aimed at empowering communities, for example community wealth building. It is interesting to reflect if support could feasibly be provided that would enable these prosocial types of businesses to better realise these ambitions. Existing catchment partnerships could play a role here.

This study also has implications for Scottish Government policy, particularly those policy areas focusing on improving resilience to environmental challenges, biodiversity and economic development. The Scottish Government has support the development of high integrity nature markets (Scottish Government, 2024b) to help facilitate greater business involvement in restoring ecosystems across Scotland. However, the findings from this study identify that when businesses perceive nature as related to their core operations, this can be a more important pathway for galvanising involvement to work with nature. Therefore, while a market approach could be strengthened (to sell credits) the importance of focusing on what we call a 'business resilience approach' that makes an explicit link between NbS and long-term business performance also needs to be recognised and supported. A natural capital approach entails attention to impacts and dependencies on nature - and we suggest that focusing especially on dependency (and how impacts may jeopardise that) may be the most important aspect for unlocking business involvement in working with nature at scale.

If more businesses do work with nature to safeguard its services, the assets and services thus protected will likely also align with the goals of multiple policy domains. This could include for example those relating to water quality, flood risk, drought management, climate adaptation, environment/ biodiversity, agriculture, health and economic development. Therefore, where public sector support or resources are required to enable further action and collaboration with businesses such as whisky producers, it is reasonable to ask if that support could be enabled by any or all of those policy areas. Cross-sectoral collaboration may also identify opportunities to deliver and enhance actions that deliver multiple benefits.

6. Conclusion

In conclusion, to help reverse declines in nature, attention is needed as to how to better involve business actors across sectors in Nature-based Solutions. Using a case study of the Scotch whisky sector, this study has highlighted how and why businesses may already work with nature: even within one sector, this happens in different ways and scales, and is driven by multiple motivations. Such motivations encompass compliance, reputation and resilience building business needs as well as moral dimensions. The ability of companies to get involved in NbS is influenced by multiple factors – including, but not limited to, knowledge about NbS and available financial and human resources. While Natural capital framings (linked to a company's own sustainability strategy) and natural capital data and tools are helpful, by themselves they do not necessarily lead to business actors to plan and deliver NbS.

Support to help businesses deepen and expand their engagement with nature therefore needs to be tailored appropriately. In particular, interventions should respond to all forms of motivations – particularly those directly linked to how a business already aims to create value, for example strategically deploying multiple measures across a catchment to reduce the risks of water scarcity

affecting operations to sustain financial value creation. Further, for creating social value, for example measures which strengthen community connections and community-nature connections for improved wellbeing. For increasing landscape scale NbS, partnership opportunities also need to be supported. This study provides useful evidence to further scale up future work by Scotch Whisky producers, as well as providing useful insights for those seeking to encourage other sectors to support and work with nature.

7. References

Abdelnour, S., Hasselbladh, H., & Kallinikos, J. (2017). Agency and institutions in organization studies. *Organization studies, 38*(12), 1775-1792.

Barbier, E. B. (2019). The concept of natural capital. *Oxford Review of Economic Policy, 35*(1), 14-36.

Bateman, I. J., & Mace, G. M. (2020). The natural capital framework for sustainably efficient and equitable decision making. *Nature Sustainability, 3*(10), 776-783. doi:https://doi.org/10.1038/s41893-020-0552-3

Bonilla-Priego, M. J., Nájera-Sánchez, J. J., & Font, X. (2022). Beyond ethics: The transformational power of overlapping motivations in implementing strategic sustainability actions. *Business Strategy and the Environment, 31*(3), 685-697.

Brand Scotland. (2024). Scotch whisky: meet the distilleries embracing sustainability. Retrieved from https://www.scotland.org/inspiration/scotch-whisky-meet-the-distilleries-embracing-sustainability

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101. doi:https://doi.org/10.1191/1478088706qp063oa

Bryman, A. (2016). The nature of qualitative research. In A. Bryman (Ed.), *Social resrach methods*: Oxford University Press.

Cakin, I., Marcello, L., Morrissey, B., Gaffney, P. P., & Taggart, M. A. (2025). Long-term monitoring of constructed wetlands in distilleries in Scotland-Evaluating treatment performance and seasonal microbial dynamics. *Journal of Environmental Management,, 375*, p.124279. . doi:https://doi.org/10.1016/j.jenvman.2025.124279

Carmen, E., Ibrahim, A., Blackstock, K., & Waylen, K. (2024). A transformations framework for mainstreaming a nature-based solutions approach. *Nature-Based Solutions*(6), 100199. doi:https://doi.org/10.1016/j.nbsj.2024.100199

Carmen, E., Waylen, K., & Gray, R. (2025). *Early insights on whisky producer engagement with environmental sustainability* Retrieved from Aberdeen, UK: https://www.hutton.ac.uk/wp-content/uploads/2024/05/JHI-D5-3_WP4_Milestone-4_2_final-report-Jan-2026.pdf

Carmen E., & Waylen, K. (2023). *Considering Whisky – a rationale and plan for focusing on the Scotch whisky sector in order to understand how natural capital can unlock private-sector investment in nature-based solutions*. Retrieved from Scotland: https://www.hutton.ac.uk/sites/default/files/files/JHI-D5-3_WP4_M4_1_WhiskyPlan.pdf

Chappin, M. M., Punt, M. J., Toxopeus, H. S., van Tilburg, N., de Jongh, C. L., Runhaar, H. A., & Spaas, G. H. (2024). How can networks address barriers to nature-based solutions? The case of agriculture and construction in the Netherlands. *Landscape and Urban Planning, 251*, 105147.

de Silva, G. C., Regan, E. C., Pollard, E. H. B., & Addison, P. F. E. (2019). The evolution of corporate no net loss and net positive impact biodiversity commitments: Understanding appetite and addressing challenges. *Business Strategy and the Environment, 28*(7), 1481-1495.

Di Pirro, E., Sessa, M. R., Zhou, J.-H., & Sica, F. (2025). Bridging the pathways of industrial and urban sustainability: A perspective for mainstreaming Nature-Based Solutions into Industrial Parks. *Environmental Science & Policy, 174*, 104278.

Dorst, H., van der Jagt, A., Toxopeus, H., Tozer, L., Raven, R., & Runhaar, H. (2022). What's behind the barriers? Uncovering structural conditions working against urban nature-based solutions.

Landscape and Urban Planning, 220, 104335. doi:https://doi.org/10.1016/j.landurbplan.2021.104335

Dumitru, A., & Wendling, L. (2021). *Evaluating the impact of nature-based solutions: A handbook for practitioners*. Retrieved from Brussels:

Eggermont, H., Balian, E., Azevedo, J. M. N., Beumer, V., Brodin, T., Claudet, J., . . . Le Roux, X. (2015). Nature-based Solutions: New Influence for Environmental Management and Research in Europe. *GAIA - Ecological Perspectives for Science and Society, 24*(4), 243-248. doi:10.14512/gaia.24.4.9

Emirbayer, M., & Mische, A. (1998). What is agency? *American journal of sociology, 103*(4), 962-1023.

Ershad Sarabi, S., Han, Q., Romme, A. G., de Vries, B., & Wendling, L. (2019). Key enablers of and barriers to the uptake and implementation of nature-based solutions in urban settings: A review. *Resources, 8*(3), 121.

Funder, M., Wlokas, H., Jhetam, T., & Olsen, K. H. (2021). Corporate community engagement professionals in the renewable energy industry: Dilemmas and agency at the frontline of South Africa's energy transition. *Energy Research & Social Science, 81*, 102249.

Gibbs, G. R. (2007). Thematic coding and categorizing. In *Analyzing qualitative data* (pp. 703). London: SAGE Publications.

Glass, J. H., Waylen, K., Reed, M. S., Peskett, L., & Stevens, B. (2025). Natural capital approaches to decision-making for collaborative landscape governance. *Environmental Science & Policy, 171*, 104133.

Glendell, M., Blackstock, K., Adams, K., Brickell, J., Comte, J.-C., Gagkas, Z., . . . Karley, A. (2024). Future predictions of water scarcity in Scotland: impact on distilleries and agricultural abstractors.

Guerry, A. D., Polasky, S., Lubchenco, J., Chaplin-Kramer, R., Daily, G. C., Griffin, R., . . . Elmqvist, T. (2015). Natural capital and ecosystem services informing decisions: From promise to practice. *Proceedings of the National academy of Sciences, 112*(24), 7348-7355.

Hoekstra, R. (2022). *How natural capital accounting can help accelerate finance for nature*. Retrieved from https://thedocs.worldbank.org/en/doc/d9ffa3ebba3d16e5809ae02888f24f09-0320052022/original/how-nca-can-help-accelerate-finance-for-nature.pdf

Ingram, J. C., McKenzie, E. J., Bagstad, K. J., Finisdore, J., van den Berg, R., Fenichel, E., . . . Mandle, L. (2024). Leveraging natural capital accounting to support businesses with nature-related risk assessments and disclosures. *Philosophical Transactions of the Royal Society B, 379*(1903), 20220328.

IUCN. (2016). *WCC-2016-Res-069-EN Defining Nature-based Solutions*. Retrieved from https://www.iucn.org/sites/dev/files/content/documents/wcc_2016_res_069_en.pdf

Kitsios, F., Kamariotou, M., & Talias, M. A. (2020). Corporate sustainability strategies and decision support methods: A bibliometric analysis. *Sustainability, 12*(2), 521.

Krause, M. S., Droste, N., & Matzdorf, B. (2021). What makes businesses commit to nature conservation? *Business Strategy and the Environment, 30*(2), 741-755.

Lafortezza, R., Chen, J., Van Den Bosch, C. K., & Randrup, T. B. (2018). Nature-based solutions for resilient landscapes and cities. *Environmental Research, 165*, 431-441.

Lamont, T. A., Barlow, J., Bebbington, J., Cuckston, T., Djohani, R., Garrett, R., . . . Graham, N. A. (2023). Hold big business to task on ecosystem restoration. *Science, 381*(6662), 1053-1055.

Lespinasse-Camargo, B., Eustachio, J. H. P. P., Bonifacio, D., Macini, N., & Caldana, A. C. F. (2024). Corporate sustainability professionals: The landscape of sustainability job positions. *Business Ethics, the Environment & Responsibility, 33*(2), 184-200.

Lester, J. N., Cho, Y., & Lochmiller, C. R. (2020). Learning to do qualitative data analysis: A starting point. *Human resource development review, 19*(1), 94-106.

Levidow, L. (2020). Turning Nature into an Asset: Corporate Rent-seeking Strategies. In K. Birch & F. Muniesa (Eds.), *Turning Things into Assets* (pp. pp. 225–257.). Cambridge, MA, USA: MIT.

Liski, A., Melville, N., & Metzger, M. (2018). Understanding the potential for co-ordinated private sector investment in natural capital–lessons from the Spey Catchment. *Scottish Environment Protection Agency: University of Edinburgh*.

Luederitz, C., Animesh, A., Rohrbacher, K., Li, T., Piper, A., Potvin, C., & Etzion, D. (2023). Non-monetary narratives motivate businesses to engage with climate change. *Sustainability Science, 18*(6), 2649-2660.

Luederitz, C., Caniglia, G., Colbert, B., & Burch, S. (2021). How do small businesses pursue sustainability? The role of collective agency for integrating planned and emergent strategy making. *Business Strategy and the Environment, 30*(7), 3376-3393.

Mace, G. M. (2019). The ecology of natural capital accounting. *Oxford Review of Economic Policy, 35*(1), 54-67.

Malekpour, S., Tawfik, S., & Chesterfield, C. (2021). Designing collaborative governance for nature-based solutions. *Urban Forestry & Urban Greening, 62*, 127177.

Manninen, K., & Huiskonen, J. (2022). Factors influencing the implementation of an integrated corporate sustainability and business strategy. *Journal of Cleaner Production, 343*, 131036.

Martino, S., Patil, I., Martinat, S., Ballesteros, A., & Waylen, K. A. (2026). Where is natural capital being used in policy-making? Results from an international review. *Ecosystem Services, 78*, 101825.

McBoyle, G. (1996). Green tourism and Scottish distilleries. *Tourism Management, 17*(4), 255-263.

Moon, H. C., & Parc, J. (2019). Shifting corporate social responsibility to corporate social opportunity through creating shared value. *Strategic change, 28*(2), 115-122. doi:https://doi.org/10.1002/jsc.2252

Nesshöver, C., Assmuth, T., Irvine, K. N., Rusch, G. M., Waylen, K. A., Delbaere, B., . . . Wittmer, H. (2017). The science, policy and practice of nature-based solutions: An interdisciplinary perspective. *Science of The Total Environment, 579*, 1215-1227. doi:https://doi.org/10.1016/j.scitotenv.2016.11.106

Osaka, S., Bellamy, R., & Castree, N. (2021). Framing “nature-based” solutions to climate change. *Wiley Interdisciplinary Reviews: Climate Change, 12*(5), e729.

Panwar, R., Ober, H., & Pinkse, J. (2022). The uncomfortable relationship between business and biodiversity: Advancing research on business strategies for biodiversity protection. *Business Strategy and the Environment*. doi: https://doi.org/10.1002/bse.3139

Pelenc, J., Bazile, D., & Ceruti, C. (2015). Collective capability and collective agency for sustainability: A case study. *Ecological economics, 118*.

Potosky, D., & Azan, W. (2023). Leadership behaviors and human agency in the valley of despair: A meta-framework for organizational change implementation. *Human resource management review, 33*(1), 100927.

Ritchie, J., & Lewis, J. (Eds.). (2003). *Qualitative research practice*. London, UK: Sage.

Ritchie, J., Ormston, R., McNaughton Nicholls, C., & Lewis, J. (2013). Qualitative research practice: A guide for social science students and researchers.

Ruijs, A., & van Egmond, P. (2017). Natural capital in practice: How to include its value in Dutch decision-making processes. *Ecosystem Services, 25*, 106-116.

Schiellerup, P. (2008). Stop making sense: the trials and tribulations of qualitative data analysis. *Area, 40*(2), 163-171.

Schürer, D. (2025). Seven questions on agency in sustainability transformations research: insights from a systematic-narrative review. Sustainability Science 2025 21: 2, 21 (2), 839–862. In.

Scotch Whisky Association. (2024). *Scotch Whisky's Economic Impact 2022*. Retrieved from Edinburgh: https://www.scotch-whisky.org.uk/media/2170/scotch-whisky-economic-impact-report-2024.pdf

Scotch Whisky Association. (unknown). Facts and Figures. Retrieved from https://www.scotch-whisky.org.uk/industry-insights/facts-figures/

Scotch Whisky Association. (unkown). Scotch Whisky Regions. Retrieved from https://www.scotch-whisky.org.uk/discover-scotch/enjoying-scotch/scotch-whisky-regions/

Scottish Government. (2024a). *The Importance of Natural Capital to the Scottish Economy*. Retrieved from Edinburgh: https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2024/11/importance-natural-capital-scottish-economy/documents/importance-natural-capital-scottish-economy/importance-natural-capital-scottish-economy/govscot%3Adocument/importance-natural-capital-scottish-economy.pdf

Scottish Government. (2024b). *Natural Capital Market Framework*. Retrieved from Edinburgh, UK: https://www.gov.scot/publications/natural-capital-market-framework/

Short, C., Clarke, L., Carnelli, F., Uttley, C., & Smith, B. (2019). Capturing the multiple benefits associated with nature-based solutions: Lessons from a natural flood management project in the C otswolds, UK. *Land Degradation & Development, 30*(3), 241-252. doi:https://doi.org/10.1002/ldr.3205

Shourkaei, M. M. (2025). Going beyond the business case for sustainability: Main business-level shifts for pursuing strong sustainability. *Journal of Cleaner Production, 518*, 145905.

Sowińska-Świerkosz, B., & García, J. (2022). What are Nature-based solutions (NBS)? Setting core ideas for concept clarification. *Nature-Based Solutions, 2*, 100009. doi:https://doi.org/10.1016/j.nbsj.2022.100009

Trim, I., & Jones, A. (2025). Do the world's largest companies integrate natural capital risks and opportunities into their operations in a meaningful way? *Biological Conservation, 302*, 110916.

Van Der Jagt, A. P., Buijs, A., Dobbs, C., van Lierop, M., Pauleit, S., Randrup, T. B., . . . Wild, T. (2023). With the process comes the progress: A systematic review to support governance assessment of urban nature-based solutions. *Urban Forestry & Urban Greening*, 128067.

Visser-Quinn, A., Beevers, L., Lau, T., & Gosling, R. (2021). Mapping future water scarcity in a water abundant nation: Near-term projections for Scotland. *Climate Risk Management, 32*, 100302. doi:https://doi.org/10.1016/j.crm.2021.100302

Wagner, M. (2022). Business, biodiversity and ecosystem services: Evidence from large-scale survey data. *Business Strategy and the Environment*. doi: https://doi.org/10.1002/bse.3141

White, T. B., Mukherjee, N., Petrovan, S. O., & Sutherland, W. J. (2023). Identifying opportunities to deliver effective and efficient outcomes from business-biodiversity action. *Environmental Science & Policy, 140*, 221-231.

Xie, L., Bulkeley, H., & Tozer, L. (2022). Mainstreaming sustainable innovation: unlocking the potential of nature-based solutions for climate change and biodiversity. *Environmental Science & Policy, 132*, 119-130.

8. Appendix 1 - Interview guide

Pre interview check list: Prep and read interviewee briefing

Start of discussion:

- Introduce researcher(s)
- Introduce research and opportunity to ask questions
- Get written consent to proceed
- Turn on audio recorder

What are our research questions?	Decision making cycle (Conceptual framework)	What do we need to know to address this?	Probing
		Background: What is the corporate structure (distilleries and brands)	And what is interviewees role

RQ1. How, when and why do whisky companies get involved in activities related to NbS?	**Strategic motivations:** Recognition (awareness) and relevance of nature	• Is sustainability a concern within the company? What is the focus? (Is there a sustainability strategy)?
		• Is the natural environment in the local landscape/ region considered relevant to the business (what)?
		  ○ Why/ why not?
		• Is nature and landscape seen as the source of any risks to the business?
		  ○ Why?
		  ○ Prompt on types of risk (market-based risks – reputational, financial etc)
		• Is sustainability (esp in terms of the natural environment) considered equally across the corporate structure, or more focused in some areas (i.e. specific geographies/ brands?)
			Socio-environmental/ social-economic challenges/ risks could be relevant here. Don't just focus on direct nature-risks – probe for indirect risks. **Other risks** (socio-economic) – for example **reputational risks** are about wider social expectations of target consumers. **Financial risks** are relate to increasing costs of business activities e.g. insurance premiums, shareholder investment)
			
			If they not sure what action could be done (i.e. low awareness of NbS) then use examples from other distilleries to illustrate)
			Probe to find out if/ how sustainability decision making is distributed – where is the power – is it brand driven, distilleries, and/ or company wide?

	Organisational agency: resources, accountability and external constraints for deciding to focus on NbS as potential course of action act	• Have you/ do you plan to get involved in working with local nature or landscape?
		  ○ Why/ why not?
		• What type of initiatives?
		  ○ Why these (what challenges/ risks are they seeking to minimise?)
		  ○ Where (on own land, within local landscape, other)?
		  ○ How? (leading/ working in partnership – if in partnership what are they contributing?)
			<u>Constraints/ Barriers</u>:
			• organisational process and structures?
			• Markets?
			• Policy?
			• Resources (£ and expertise)
			• Uncertainty – inadequate evidence of effectiveness / inadequate localised data/ information

	Response and involvement	• Across the sector, what **barriers** may be hindering involvement in nature-based initiatives (within organisations and the wider context)? • **What opportunities** to you see for helping the sector to maintain and improve the natural environment more ○ (what needs to change to help them do more, internally and/ or externally)?	

		• If not involved in nature-based initiatives is there anything else they do in relation to minimising nature-related risks (i.e. contribute to/ commission studies etc?)	
RQ2. Does – or could - Natural Capital framings, tools or data play a role in encouraging business involvement in NbS?	**Strategic motivations:** Recognition (awareness) and relevance of nature	• How are nature related risks assessed (do they use data and tools, what and why/ why not)?_ • If no action/ focus on natural environment, would access to data and tools help? How? If no, why not?	If not, probe if there is anything that would help/ encourage?
	Organisational agency: resources, accountability and external constraints for deciding to focus on NbS as potential course of action act	• Is there anything else beyond access to data/ tools etc that would encourage you to consider nature-based initiatives? o What? Why?	
	Response and involvement	• If they do act, how do they decide what to do and where to do it? (expertise of others? Crunching data themselves?)	
RQ1 & RQ2	**Organisational learning**	• Has anything changed (how they view and act) within the organisation; • As they have examined nature-related risks (data/ information/ tools)? • Through their involvement in nature-based initiatives? o What, why?	Change in staffing – see new post /expertise needed?
	<u>Recommendations, follow up and further contacts</u>	• Any recommendations for scientists or policy makers seeking to enable /encourage whisky sector to do more support for sustainability in terms of the natural environment and the local landscape/ region)? • Would they be interested in findings etc or further information about possible tools etc that could help?) • Would they be interested in further discussing this topic (e.g an online discussion involving different companies and the SWA?)) • Suggestions for other companies or contacts to speak to? -	
Wrap up interview		**Thank you and end.** - Next steps for us - when results are available to share Do they have any questions for us?	

9. Appendix 2 - Workshop plan

Scotch whisky sector on-line workshop: Whisky and Nature

Date: 16th April 2026 10-12pm

Aims of workshop

1. To share early insights from research conversations with whisky producers and strategic stakeholders seeking to support environmental sustainability in the sector AKA SHARE
2. Explore what is needed to enable whisky producers across the sector to develop nature-based initiatives more in the future AKA GET A BIT MORE DATA

Agenda

1. Welcome and housekeeping
2. Event aims
3. Study background
4. **Presentation to share (initial) findings 1**: Nature-based interventions, motivations and roles
5. Q&A
6. **Presentation to share (initial) findings 2**: Natural capital data and tools
7. **Group discussions**: The use of natural capital data and tools?
8. Feedback
9. **Presentation to share (initial) findings 3**: Challenges and opportunities for more use of NbS in the sector
10. **Group discussions**: Additional challenges and ideas for the future?
11. Feedback
12. Next steps and close

Participants

- Existing study participants (people with a sustainability related role within whisky production companies)
- Strategic stakeholders
    - Whisky sector representatives (e.g. sustainability coordinator within the SWA)
    - Nature and business-related public sector organisations (Enterprise Agencies)
    - Non-government organisations with a nature/ climate change remit (e.g. Verture)
    - JHI NbS and water expert

Detailed plan for facilitators

Time	Item	What	Who
5 mins 10:00 – 10:05	Welcome	Aim, introductions (to us+why we are here) and housekeeping incl informed consent Use of chat function	EC RG to press record
5 mins 10:05 - 10:10	Aims and structure	Two aims Agenda Use slido wordcloud to ask why did you come today	EC slides RG to help with slido set up and introduce

			If less than 12 consider not using later. Ask people to put things in the chat instead for this session.
10 mins 10:10 - 10:20	**Background**	Set the scene - D5-3 Definition of NbS, plus examples of sector challenges Whisky study aims and methods (*not a supply chain focus – but it clear this is important from discussions)*	KW slides RG to put report in the chat JHI-D5-3_WP4_Milestone-4_2_final-report-Jan-2026.pdf
5 mins 10:20-10:25	Q&A		KW moderate RG take notes
10 mins 10:25-10:35	**Study findings A**	• Actions: Type of nature-related interventions • Motivations (6 pathways) • Roles	EC Slides
10 mins 10:35 – 10:45	Q&A	Any thing missing or surprising?	KW moderate EC as main responder RG take notes
15 mins 10:45 – 11:00	**Study Findings B**	• Challenges and opportunities • Add slido question to rank key challenges and opportunities they agree with (and 'other')	EC slides RG to help with slido set up and introduce
20 mins 11:00 – 11:20	**Break out 1: Challenges and ideas for the future for more NbS in the sector**	SAME GROUPS Trigger questions: 1. **Any additional challenges?** 2. **How can we enable the opportunities?**	**Facilitators** • **Select to go in your room** • **Record each breakout discussion** and summarise key ideas discussed.
10 mins 11:20 – 11:30	**Study Findings C**	• Natural capital data and information (what and why)	EC Slides **RG set up break out rooms** **RG to remind all facilitators to press record in their own rooms!**
20 mins 11:30-11:50	**Break out 2: Natural capital data and information**	• Parallel break out rooms **(Groups 1-3 – whisky companies)** Trigger questions: • **What data /info are you using to guide decision making?**	(see below for break out room allocation) **Facilitators** • **Select to go in your room**

		• **What would be useful?**
		
		Prompts:
		• Think about **scale**
		  ○ e.g. on site/ at source data or catchment etc.
		• Think about source/
		• Think about **topic/aspect** of NC
		  ○ Prompts: water, energy, peat use, carbon (scope 3 emissions), biodiversity, anything else?
		  ○ Link to organisational type/ motivation?
		
		• Whose data (collecting data or using data sourced elsewhere?)
		
		(Group 4 – Enterprise agencies)
		Trigger question:
		• **How are you supporting uptake of NbS in the sector?**
		• **Does this include a focus on data and information? Why/ why not?**
		
		• Facilitator prompt: Try and focus on access to and capacity to use data and information in strategic decision making.
			• **<u>Record each breakout discussion</u>** and summarise key ideas discussed.
			
			Facilitators to take notes on key issues discussed (not verbatim but as a summary/ overview)

5 mins 11:50-11:55	Facilitators Feedback	2 key themes each	KW moderate RG take notes
5 mins 11:55 - 12:00	Feedback and next steps END	On item each (if time) Thanks More analysis Share outputs.	All/ EC moderate and close. RG take notes if relevant.

Breakout groups

Group 1: Facilitator KW Large multinational companies	Group 2: Facilitator KT Independent/ innovators (already doing lots) *(note: Group 2&3 merged in second set of group discussions)*
Group 3: Facilitator KB Traditional companies	Group 4: Facilitator EC Strategic stakeholders/ intermediaries

Pre event checklist

- RG - All facilitators set as co-host (to enable recording)
- RG set up slido
- EC/ RG 5 days before send out;

- Information sheet (new participants)
- Consent form
- Report

Post event

- EC/ RG - Thank you email
- ALL - Facilitators to share recordings with RG
- RG – Securely store data, check transcripts and load into NVIVO
- EC/RG – develop and share report on key discussion items and send to all participants