Interim Impact and Economic Evaluation of NSIP Pilot and ETP

A report for UK SPACE AGENCY

FINAL

know.space

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Contents

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to understand clearly and with certainty

About us

know.space[1] is a specialist space economics and strategy consultancy, with offices in London and Edinburgh. We are motivated by a single mission: to be the source of **authoritative economic knowledge for the space sector**.

www.know.space hello@know.space

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[1] **know.**consulting ltd. (CRN: 12152408; VAT: 333424820), trading as **know.**space

Executive Summary

Introduction

know.space have been commissioned by the UK Space Agency to undertake Monitoring and Evaluation (M&E) and benefits management activities for NSIP, in collaboration with our partners at RAND Europe (leading on process evaluation), and our expert advisers.

This report is the **Interim Impact and Economic (value for money) Evaluation of projects through the NSIP Pilot and Emerging Technologies Programme (ETP) funding strands**. In scope are the 42 projects funded through the different strands of the NSIP Pilot (2020-2024) and the 41 projects funded through the four calls of the ETP (2023-2025), many of which are still in progress.

Many projects funded under ETP Calls 3 and 4 (and a small number of Pilot projects) are still ongoing and as such, **most intended outcomes have not materialised at this stage**. Our final evaluation, scheduled for delivery in Q1 2026, will benefit from more time having passed and so more impacts having been realised, enabling more in-depth answers to be provided.

Our evidence-collection combines **desk-based research** with **stakeholder interviews**. Given that most Pilot projects concluded several years ago, we faced some challenges in data collection given staff and organisational changes. Overall, we interviewed 42% of NSIP Pilot project leads and 90% of ETP project leads (50 interviews in total). Additional interviews were held with senior HMG stakeholders (3), call reviewers (6), and unsuccessful applicants (25) to deepen our understanding of the counterfactual scenario where no ETP/Pilot funding was received. Additional comments were provided by email, and quantitative evidence was gathered through a light-touch **survey** to ETP project teams, to which we received 32 responses.

We used a **theory-based evaluation** approach, using **contribution analysis** to assess the extent to which ETP/Pilot funding contributed to observed outcomes by examining the previously developed theory of change. This was supplemented by **quasi-experimental (econometric) analysis** to assess the extent to which funded has led to observed outcomes.

Impact Evaluation - Key findings

For both strands of funding there is a similar narrative. There are **many positive signals to highlight, and tangible outcomes on which to report, though at the same time we are – inevitably – at a relatively early stage in the longer-term impact story** which limits the ability to come to definitive conclusions on the success or otherwise of the programme(s) at this stage. The success of the Pilot and ETP as programmes will ultimately be determined by the longer-term success (or otherwise) of funded projects, and whether new products and services successfully reach market, secure investment (where relevant), and gain market share. At the current time, we are reporting on emerging impacts, with Pilot and ETP funding often acting (in the words of one interviewee) as a "**necessary stepping stone**" on the way to reaching market.

The impacts we report on are, nonetheless, very real. For example, significant Technology Readiness Level (TRL) raising has occurred and the Pilot and ETP both appear to be **on course to meet the broader NSIP programme objective of raising TRLs by at least 2**. While revenue and investment forecasts are optimistic (and in our view, often not credible), there is emerging

evidence of new investment, revenues, reputational gains, productivity benefits, improvements in technical skills, and broader benefits to the UK space industry's reputation and leadership.

On the other hand, there is **limited evidence so far that these ambitious forecasts are on course to be met**. While there are examples of where credibly attributable outcomes have already occurred, in general the message was that **the investment story is "only just starting"**, with many ongoing discussions, the outcome of which will be important to capture in future.

Both the Pilot and ETP are, in our view, marked by **high additionality**. Almost unanimously, project teams said that the projects and technological development seen would not have taken place in the absence of UK Space Agency funding, and this was reinforced by unsuccessful applicants who typically said either that their idea had not been taken forward, or that it had been progressed overseas. We view that **both the Pilot and ETP have led to technological advancement today that would not otherwise have been seen to the same timescales**.

Many of the benefits at this stage are driven by **spillover impacts**, such as a Pilot project that was ultimately unsuccessful but where the funded company has gone down a different (non-space) path to secure significant new investment, revenues and exports.

Still, few new products and services have yet reached market, so **many of the longer-term benefits are yet to be seen**. This is not unexpected given the relatively low TRLs of funded projects, with project teams typically keen to stress that further public funding is often required before they will be (external) investment ready. With the ambitious forecasts in mind, therefore, **the bigger picture story is one of expectations**. It will be critical, therefore, for further monitoring and evaluation activity to track the extent to which these expectations become reality.

Our impact evaluation considers impact against five themes:

Innovation

> *"One investor had a condition that UK Space Agency NSIP [Pilot] funding was gained before private investment could be finalised*

- **Distribution of funding** – NSIP Pilot and ETP have supported a range of organisations, with NSIP Pilot projects supporting large companies, SMEs and research organisations. ETP has relatively concentrated support for universities (and SMEs to a lesser extent).
- **TRL advancement** – both pathways have supported projects with low initial technological maturity to reach mid-level TRLs, with some exceptions. ETP projects have increased TRLs by 1.8 on average, and seem on course to meet broader UK Space Agency objectives for NSIP. Across the NSIP Pilot calls, we found a (caveated) average TRL increase of 2.8.
- **Limited commercialisation to date** – while crucial early progress has been made in technology maturation, further funding, technology development and commercialisation efforts are necessary to realise commercial benefits (e.g. revenues) or disrupt the industry status quo. This is, however, not unexpected at this stage.
- **Intellectual property** – organisations across both calls have developed informal IP, and are balancing patent plans with concerns over cost and secrecy in ongoing conversations. ETP has led to at least 11 digital assets being created for data processing, modelling, and analysis.
- **Productivity** – most project teams (e.g. 20 of 31 ETP survey respondents) report productivity increases as a result of funding. Examples of key drivers include recruitment / upskilling, and investment in new facilities, hardware and software. At least 12 facilities have been built or upgraded across both pathways, helping to develop UK capabilities.
- **North Star Metric** – for Pilot projects, there are several strong examples of external investment events linked to funding (e.g., one firm raising £80m) but overall, our data is patchy. We have more comprehensive North Star Metric data on ETP projects, though

given their early stage, investment outcomes are limited at present. Right now, ETP teams appear to be typically more focussed on further public grant funding opportunities.

Scientific and societal

> *The outcome story of our Pilot funding is solid – the knowledge we developed went on the provide maps for the Australian floods a couple of years ago. [As a result of not receiving follow-on funding] We haven't been able to get traction in the UK, though.*

- **Alignment with development goals** – ETP and NSIP Pilot projects closely align with UN Sustainable Development Goals related to innovation, collaboration and economic growth.
- **Climate and space sustainability** – the two funding streams display complementary focuses, with ETP projects largely geared towards space sustainability (59% of ETP projects applicable, using a broad definition of space sustainability), while NSIP Pilot activities are more applicable to climate change objectives (70% of NSIP Pilot projects).
- **Dual-purpose potential** – at least 23 projects across ETP and NSIP Pilot have dual-use applications.
- **Publications** – ETP projects reported a modest research output so far, with 15 published papers and another 17 in development, while NSIP Pilot projects reported publishing 3 papers. Citation impact is similarly limited so far, but will take time to accrue. Ultimately, we have not seen evidence yet of a strong story with regards to scientific impact.
- **Geographical distribution of funding** - funding from both streams is relatively concentrated in South East England, followed by Scotland.

UK Competitiveness and Reputation

> *ETP funding has positioned us for future project work with ESA to develop concept further, which we might not have gained at this stage without Space Agency support.*

- **Total partnerships and collaborations –** across both pathways, only 13 of the 84 total projects (15%) were delivered without partner organisations, with 11 of these being ETP projects.
- **New and strengthened partnerships –** in total, project teams report that 68 partnerships have been strengthened (30 ETP, 38 NSIP Pilot), with many still active today. NSIP Pilot teams mostly leveraged existing partnerships, while at least 16 new partnerships were developed for ETP.
- **UK supply chain –** 70% of ETP supply chains are UK based, but we lack evidence to assess NSIP Pilot supply chains.
- **Reputation gains for UK organisations –** the vast majority of respondents felt UK Space Agency support had improved their reputation in relevant sub-sectors (100% NSIP Pilot, 85% ETP), with some ETP projects saying it is too early to say.
- **Strengthened competitive offering –** most project teams feel NSIP funding has strengthened their competitive offering (5/6 NSIP Pilot, 30/36 ETP), but highlighted they are at low technological maturity, meaning further funding/investment and commercialisation is necessary.
- **Evidence of early UK leadership –** both calls have contributed to early UK leadership in niches, although caveats apply. The NSIP Pilot has also led to soft power benefits in the form of at least seven international follow-on mission opportunities. Availability of follow-on UK grant funding has been listed as a potential barrier to realising these in the future.

Capturing Market Share

> *ETP did shorten our way to market. But we need to be quick, because other competitors have now heard of our technology, and it's only a matter of time before someone else jumps on this. This is why we are not sharing our results yet. (…) Now we are looking at ESA funding, because the UK Space Agency hasn't published any call.*

- **Route to market** – NSIP Pilot and ETP projects have had limited impacts in terms of technologies having been commercialised so far - only 2, by Pilot projects. However, 35 new technologies, products or systems are expected to be commercialised in the future, with 83% of these having been reported by ETP project teams (in part likely reflecting that we were able to speak to more ETP than Pilot project teams).
- **New clients and customers** – both funding streams led to some impact in terms of customer base expansion, with teams reporting 11 new clients and customers, as well as 31 expected in the future.
- **Market access** – both funding streams have generated significant market access impacts, with 12 new market segments and international markets already accessed, and 37 more expected in the future. The anticipated future access is largely driven by ETP projects, which expect to enter 31 of these markets, although this may reflect the higher number of ETP teams interviewed.
- **Expected income impacts** – our analysis captured some early revenue impacts, with £130k reported across three ETP projects and one NSIP Pilot project reporting £1.1m in attributable income. In terms of 6-year projections from project start, ETP projects provided self-reported estimates of up to £67m in expected income across 20 projects. Meanwhile, two NSIP Pilot Implementation projects projected potential revenues of £4.6m and £190m, respectively. Evidence of these optimistic forecasts being realised is, as yet, limited.
- **Spin-ins and spin-outs** – NSIP Pilot encouraged the creation of two spin-out companies. While one has been dissolved in 2023, the other developed to become an NSIP Major Project funding recipient. In addition, we found some limited evidence of companies, institutions, and project teams entering the space sector through ETP funding, and space companies finding new non-space applications for their products and services.

Skills and employment

> *The sort of skills needed in this area are extremely rare. UK Space Agency funding has allowed us to bring on younger staff, enabling those near retirement to pass on important knowledge.*

- **Employment** – ETP and NSIP Pilot cumulatively supported 26 job years of employment, creating 63 UK FTEs through NSIP Pilot and 19 through ETP. As many ETP projects have only recently started, greater job impacts are anticipated in the future, with 383 new FTE roles projected over the next six years.
- **Expertise** – Pilot teams are dominated by engineers working in industry, whilst ETP teams are more academic. This reflects the make-up of funded organisations.
- **Early career and student involvement** – the two funding streams have supported at least 60 early-career workers, along with 2 students through the NSIP Pilot and 24 students plus one apprentice through ETP.
- **Upskilling** – we have strong examples of technical upskilling through the Pilot, but data is too patchy to draw strong conclusions. ETP is leading to technical skills development in specialised fields, especially for early career workers, with the vast majority of firms reporting improved skills as a result of funding (95%, or 35 of 37 survey respondents).

Economic Evaluation

> *North Star Metric numbers cannot be true… it's very finger in the air and may as well make (you) look good.*

The overarching conclusion of our economic evaluation mirrors the impact evaluation, in that **while there are tangible and monetisable impacts that can be measured at this stage, the long run value for money of Pilot and ETP funding will depend on the ultimate success and market capture of funded technologies** – which in turn (given the relatively low TRL focus of the programmes) will depend on what comes next.

We quantify leveraged **external investment, internal investment, GVA and the value of job creation**, using collected through the impact evaluation, **supplemented by econometric / quasi-experimental analysis**, and using a **wage premia approach** which assumes that in the absence of Pilot/ETP funding, those in roles created through funding would instead be working in similar roles outside the sector with different salaries.

For the Pilot, we estimate that the **real, discounted and attribution-adjusted UK benefit of the Pilot is at least £72m to date**. This total is **driven by a few, large external investment deals** and likely represents an underestimate of the benefits deriving from the NSIP Pilot to date, due to data gaps.

Our quasi-experimental analysis found (with caveats) that **Pilot funding is associated with 3-4 new jobs per funded organisation (lead and partner)**. Applying this to the Pilot more broadly we estimate that funding would lead to the creation of around 300 jobs in total, with £2.3m in economic value (real, discounted). This is larger than in the 'core' analysis though external investment events are still the primary driver of benefits.

For ETP, the real, discounted and additionality-adjusted benefit of ETP to date has been at least £1.9m. While low, this reflects a point in time where **many projects are still in progress and products have not yet reached market**, or major investment secured.

However, **the picture changes if forecasts are included**, with the **benefit rising to £40m** (including some optimism-bias adjustment) in real, discounted terms. A lesson from the Pilot analysis is that large external investment events (and the extent to which they are attributable to UK Space Agency funding) can be the primary driver of long-run benefits. The current low numbers reflects that we have no evidence of significant, attributable events yet. It also reflects evidence gaps, with 37% of ETP organisations not responding to the survey.

The implication from our analysis in this interim economic evaluation is that **continuing to track the benefits arising from the Pilot and ETP over the coming years will be crucial in assessing the extent to which the programmes have offered value for money. At present, it is too soon to draw firm conclusions on value for money.**

The final evaluation will revisit and extend our analysis, where we will provide updated estimates of quantifiable benefit. We will also calculate the NPSV and NPSV/DEL associated with both programmes.

Lessons Learned (impact)

While lessons learned will be assessed in more depth in our final evaluation, initial reflections include:

1. **The question of 'what comes next' is key** – with the focus of Pilot/ETP typically on low-TRL projects many teams noted that further public investment is needed before they reach market and/or seek private investment. Without a clear funding vehicle at Pilot/ETP project close, many ideas risk 'sitting on the shelf' and failing to progress to meaningful impact.
2. **Spillover benefits can be substantial and should not be seen as 'ancillary' benefits** – arguably the largest driver of the (interim) economic evaluation was a partially Pilot-attributable investment in a project that was unsuccessful in its core aims and has gone down a non-space direction. Project 'failure' can still lead to sizeable impacts elsewhere, as knowledge builds on knowledge.
3. **Large investment events are the primary driver of benefits** (at least at this stage) – any UK Space Agency efforts to facilitate investment by (say) joining up project teams with accelerator programmes or investor communities has the potential to lead to sizeable benefits if it can catalyse investment that may not otherwise happen and avoid 'siloed' programmes.
4. **A small number of 'big wins' typically drive benefits** – not every project has succeeded or will succeed, nor should they be expected to. Appropriate appetite for risk and failure is needed to ensure that the 'fertile ground' for these big wins is created. Furthermore, the nature of a given call affects who gets funded (industry/academia) and so affects impact.
5. **Understanding impact relies on good data, which is difficult to retrofit** – our evaluation has been hampered by a lack of data, particularly for NSIP Pilot. We may never know many of the benefits which arose/will arise from the Pilot. This reflects time passed since projects' start but also changes in reporting requirements. Ensuring M&E frameworks are built in from the beginning is essential to understand impact. Given the long-term nature of impact pathways, processes to monitor impacts over 5-10 years are also crucial.

1 Introduction

1.1 Context

The National Space Innovation Programme (NSIP) is a flagship programme of the UK Space Agency, designed to support the research and development of innovative products, services, and technologies with space sector applications. The core aims of NSIP are to:

- **Catalyse Investment**: Supporting projects that multiply the value of non-government contracts and capital secured by the UK space sector by five to eight times the value of NSIP investment by 2030.
- **Drive Innovation**: Supporting an average improvement in Technology Readiness Level (TRL)[2] of 2 or more for supported projects, as measured over the lifetime of each project.
- **Capture market share**: Generating new products and services that are sold to the fastest growing and potential space markets by 2030.

NSIP supports the delivery of *National Space Strategy*[3] pillar three activities to "grow the UK as a science and technology superpower" and aligns with several of the priorities of the Department for Science Innovation and Technology (DSIT).

know.space have been commissioned by the UK Space Agency to undertake Monitoring and Evaluation (M&E) and benefits management activities for NSIP, in collaboration with our partners at RAND Europe (leading on process evaluation) and expert advisers. The study will help the Agency to understand the effectiveness of the fund and its impacts. This work is part of broader UK Space Agency M&E activities, which enable the Agency to assess progress, remain accountable, and proactively adjust their approach to programmes, managing benefits realisation through evidence-based decision-making.

Our overarching M&E and benefits management activities cover all projects funded under the NSIP Pilot, the ETP and all subsequent funding calls, including current Kick Starter and Major Project calls. Our approach is split into four key strands of project work (see below).

This report, part of Strand 4, provides an **interim impact and economic (Value for Money) evaluation of projects funded through the NSIP Pilot and ETP funding strands**. A full impact and VfM evaluation of NSIP Pilot and ETP will follow in Q1 2026. This report does not include the process evaluation, which is part of Strand 3 and will be conducted by RAND Europe. It also does not cover Kick Starter and Major Project funded activities, which are analysed in the separately-delivered first Annual Monitoring Report for these strands.

The **NSIP Pilot** and **Enabling Technologies Programme (ETP)** were the precursors to current NSIP Major Project and Kick Starter project activities. Building on the foundations set by the 2020-21 Pilot and the four 2022 and 2023 ETP calls – many projects of which are still active – NSIP has evolved into a multi-year £65 million programme committed to funding projects through to 2027.

[2] TRLs indicate the stage of development a technology has reached, providing a standardised framework for evaluating the readiness and potential risks associated with adopting emerging technologies. TRL 1 (basic principles observed and reported) is the lowest level and TRL 9 (actual system 'flight proven' through successful operations) is the highest.
[3] HM Government, 2021. *National Space Strategy*. Available at: https://assets.publishing.service.gov.uk/media/6196205ce90e07043d677cca/national-space-strategy.pdf

NSIP Kick Starters and NSIP Major Projects are currently the focus of our Strand 2 monitoring activities.

The NSIP Pilot targeted funding for projects in earth observation, climate change, and ubiquitous telecommunications. In FY20/21, 27 grants were awarded to UK industry and academic-led teams, with five of these awarded to internationally-focused projects. In FY21/22, 11 of these projects received additional funding to further develop their space-related innovations, and in FY22/23, two projects received continued support under the NSIP Pilot.

Table 1 *Time and description of Pilot funding calls*

Funding	Projects timeline	Thematic area
Pilot 2020	2020/21	Earth Observation to Tackle Climate Change Ubiquitous Communications for Enterprise, Consumers and Government
Pilot International	2020/21	International collaboration
Pilot Implementation	2021/22	Earth Observation to Tackle Climate Change Ubiquitous Communications for Enterprise, Consumers and Government
Pilot Implementation-Down-select	2022/23-2024/25	

The Enabling Technologies Programme (ETP) has funded 41 projects in different thematic areas (see table below), with an open call also held for emerging technologies that did not fit into these criteria. Originally planned future calls of ETP will now come under the Kick Starter pathway. The four ETP calls considered in this report are detailed in **Table 2** below.

Table 2 *Timeline and description of ETP funding calls*[4]

Funding	Projects timeline	Thematic area
ETP Call 1	Early February 2023 to end August 2024	In Orbit Servicing and Manufacturing (IOSM) and Optics
ETP Call 2	Early April 2023 to end May 2024	Technology for Space Science
ETP Call 3	August 2023 to February 2025	Technology for Sustainability in Space
ETP Call 4	November 2023 to December 2024	No focus specified (open call for space technology).

Many projects funded under ETP Calls 3 and 4 are still ongoing and as such, not all or even most intended outcomes have materialised at this stage. These results will be thoroughly assessed and included in our full evaluation, scheduled for delivery in Q1 2026. Even in this 'final' evaluation, there will be recognition that impacts can take many years to fully materialise (e.g. as new products and services are subsequently developed and rolled out) and as such it will inevitably be commenting on an emerging impact narrative.

1.2 Overview of approach

1.2.1 Data collection and monitoring

This report is based on qualitative and quantitative evidence gathered through **desk-based research** of project documentation and online resources, **stakeholder interviews** with project

[4] These represent the anticipated call timelines. In reality, there were some delays.

leads and a **survey to ETP project teams**. We also trial the use of **quasi-experimental methodologies**.

Our desk-based research leverages resources including applications forms and annexes, particularly the Finance and North Star Metric annexes[5], where these exist. We also utilise Final Reports where projects have concluded.

Stakeholder interviews

Building off early 'meet and greet' interviews held over summer 2024 (which included interviews with senior HMG stakeholders in the UK Space Agency and DSIT), in-depth interviews were conducted with funding recipients in October and November 2024. Most Pilot projects have concluded at the time of writing and so interviews were largely **retrospective**, asking interviewees to cast their minds back to work they may have conducted up to 4-5 years ago. Meanwhile, many ETP projects are still ongoing or have recently concluded, though ongoing projects were at different stages of project completion. As such, we discuss projects at **varying stages of benefits realisation**, which should be borne in mind when interpreting our findings.

Interviews followed a semi-structured format utilising a topic guide agreed with the UK Space Agency. Conversations with Pilot project teams were generally more open-ended, reflecting that many of these projects finished years ago and **sometimes interviewees struggled to recall specific (attributable) impacts**. Conversations with all projects covered an overview of project progress, the likely counterfactual, any collaborations enabled by funding, research impacts, the route to market and leveraged investment. With Pilot projects, employment and skills impacts, as well as reputational impacts, were also covered in interviews, while these impact themes were set out in the survey to ETP teams (see below). We also discussed NSIP and ETP processes at interview, to minimise the burden on project teams.

In total, we interviewed **42% of NSIP Pilot project leads** and **88% of ETP project leads**. The lower response rate for Pilot-funded organisations reflects the fact that most Pilot projects have concluded, some years ago. Therefore, people have often changed roles, and some organisations have undergone restructuring in this time.

Additionally, we conducted short **interviews with 25 unsuccessful ETP applicants[6]** to gain understanding of the counterfactual, as well as insight to inform the process evaluation[7]. Lastly, **6 interviews were held with NSIP and ETP reviewers**. These conservations largely focussed on process but have helped to inform our quasi-experimental analysis.

Beyond these interviews, several individuals – largely unsuccessful Pilot/ETP applicants – declined an interview but provided **comments by email**, which we factored into our analysis.

Surveys

Given the time which has passed since many NSIP Pilot projects received funding, we anticipated that a survey would likely have a very low response rate and chose to gather this information through interviews instead. **All ETP project teams (leads and partners) were sent a survey**.

The surveys were distributed from October to November 2024, with invites typically sent in one wave to project leads and partners immediately following interviews. Lead organisations and

[5] North Star Metric reporting was only introduced in 2022, so we do not have this data for the NSIP Pilot or ETP Call 1.
[6] We did not attempt to engage unsuccessful Pilot applicants given the time which has passed since applications, but we did speak to organisations who had been unsuccessful at the Implementation phase.
[7] Interviewees had often applied for multiple funding rounds, and were successful in some and unsuccessful in others. As such, interviews often covered multiple projects and where there had been a successful project, this was the focus of conversation.

partners were sent slightly differing surveys, with the survey to lead organisations focussed on project-level impacts as well as their own organisations[8], whilst the partner survey covered organisation-level impacts only. The **survey was concentrated on quantitative impacts** best captured by survey for consistency across funded projects, notably including North Star Metric impacts, job creation and Likert-scale questions[9]. It covered **both impact and process** evaluation questions.

In total, we achieved **32 responses to our surveys** to ETP project leads and partner organisations[10] (16 from lead organisation, 16 from partners).

1.2.2 Econometric Methods (Quasi-experimental methodologies)

Econometric methods can offer a robust means of quantitatively identifying and estimating the magnitude of a **causal treatment effect** without using randomisation. However, it carries far **greater data requirements** than the theory-based approach used elsewhere in this report. We explore the possibility of using these methodologies to robustly assess whether Pilot and ETP funding has led to the revenues, employment and investment outcomes we observe.

Our econometric activities, to date, include the following:

- The **scope** of the interim econometric analysis, including explanation of data availability
- **Descriptive analysis** of the available data
- **Interim findings** and discussion

This report represents the first time that we have put the econometric methods into practice for any of the streams of NSIP funding. It therefore represents a **testbed** for the further development of these methodologies in future, laying the foundations for further use of these methods to assess the impact of ETP and the Pilot in the Final Evaluation, as well as the Interim (and ultimately Final) Evaluation of NSIP Kick Starter and Major Projects.

The key challenge to this analysis is the **small sample size** owing to the small numbers of projects funded, which poses limitations to the statistical power which can be achieved. We found that **only the NSIP Pilot was suitable for econometric analysis** and at this stage, only indicators related to **jobs created** (and not yet revenue of investment) could be analysed with sufficient robustness. Central to the analysis was use of the Beauhurst business intelligence platform (a database of all UK private companies), combined with data compiled from application forms and qualitative insight gathered from interviews with NSIP reviewers and programme documentation. Using Difference-in-Difference and a regression discontinuity approach, we consider the impact of receiving NSIP Pilot funding (across all strands) on organisational employment, compared to a control group of similar, non-funded organisations (we consider both 'wide' and 'narrow' control groups, which each have respective advantages and disadvantages).

This analysis is a starting point and as more time elapses since funding was awarded, data will improve. In the final evaluation, we will aim to include turnover (and, if possible, investment) in the analysis, once we have post-treatment data on more organisations. The headline conclusion from this analysis is that for firms with fewer than 15 employees, there is evidence to suggest that **receipt of NSIP Pilot funding is associated with an increase in organisational employment**. We use this finding in the Economic Evaluation, albeit as a secondary analysis to an approach based on evidence directly received from project teams. For more detail, see the discussion in the Economic Evaluation section.

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[8] Lead organisations typically have the best overview of project-level progress.
[9] The Likert scale is a method for measuring opinions or perceptions, where respondents are asked to choose an answer from 'strongly disagree' to 'strongly agree'.
[10] Note: whilst we had not originally planned to survey ETP project teams, the decision was made to survey these teams given most of these projects are ongoing.

2 Impact evaluation

2.1 Innovation

Driving innovation is one of the three core aims of NSIP, and is an objective which cuts across all NSIP pathways. The recent HM government *Invest 2035: the UK's modern industrial strategy* Green Paper stresses that innovation will be "at the heart" of a new industrial strategy, with innovation listed as one of the six key policy areas. 'Unleashing innovation across the UK space sector' is also the first goal contained within the UK's National Space Strategy.

Catalysing investment is another core objective of NSIP, as illustrated by the UK Space Agency's principal metric of success - the North Star Metric. This measure assesses outcomes of programmes and missions by the amount of private investment[11] generated. The NSIP Pilot is the UK Space Agency's first dedicated innovation fund, featuring competitive open calls to pursue high-risk, high-reward space projects. ETP was also established to support the research and development of technologies between TRL 1 and 4.

Summary of key findings

- **Distribution of funding –** NSIP Pilot and ETP have supported a range of organisations, with NSIP Pilot projects supporting large companies, SMEs and research organisations. ETP has relatively concentrated support for universities (and SMEs to a lesser extent).
- **TRL advancement –** both pathways have supported projects with low initial technological maturity to reach mid-level TRLs, with some exceptions. ETP projects have increased TRLs by 1.8 on average, and seem on course to meet UK Space Agency objectives. Across NSIP Pilot calls, we found a (caveated) average TRL increase of 2.8.
- **Limited commercialisation to date –** while crucial early progress has been made in technology maturation, further funding, technology development and commercialisation efforts are necessary to realise commercial benefits (e.g. revenues) or disrupt the industry status quo. This is, however, not unexpected at this stage.
- **Intellectual property –** organisations across both calls have developed informal IP, and are balancing patent plans with concerns over cost and secrecy in ongoing conversations. ETP has led to at least 11 digital assets being created for data processing, modelling, and analysis.
- **Productivity –** most project teams (e.g. 20 of 31 ETP survey respondents) report productivity increases as a result of funding. Examples of key drivers include recruitment / upskilling, and investment in new facilities, hardware and software. At least 12 facilities have been built or upgraded across both pathways, helping to develop UK capabilities.
- **North Star Metric –** for Pilot projects, there are several strong examples of external investment events linked to funding (e.g., one firm raising £80m) but overall, our data is patchy. We have more comprehensive North Star Metric data on ETP projects, though given their early stage, investment outcomes are limited at present. Right now, ETP teams appear to be typically more focussed on further grant funding opportunities.

[11] The North Star Metric also measures matched funding, internal investment and revenues.

2.1.1 NSIP Pilot projects

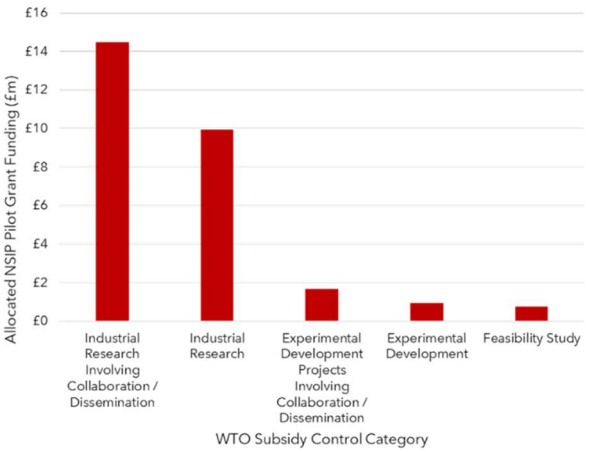
Distribution of NSIP Pilot funding by activity and organisation type

Across the different streams of the NSIP Pilot, including the Pathfinder, International, and subsequent Implementation funding streams, the **UK Space Agency has supported 42 Pilot projects** - which have focused on industrial research and experimental development, as well as a small selection of feasibility studies.[12]

Of the £28.1m total allocated through the different NSIP Pilot streams, the UK Space Agency allocated **£24.4m to industrial research** (86%), of which £14.4m involved collaboration and dissemination (as classified by the World Trade Organisation – WTO - subsidy control categories). The objectives of these projects are to ultimately develop new knowledge through applied research, which could support new product and service development with subsequent commercialisation activities.

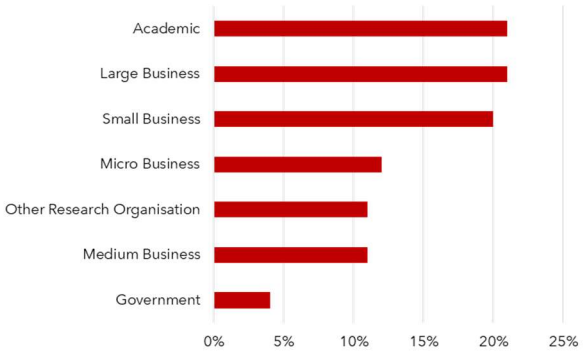
The UK Space Agency have also allocated £2.6m (9%) to experimental development through the Pilot, which aims to bring these market applications closer to market readiness, e.g. through prototype development and testing. To a lesser extent, the UK Space Agency have also funded feasibility studies (£500k), which determine the practicality and viability of progressing with the project through market analyses, cost estimation and risk assessment; and fundamental research (£500k), which supports experimental work that primarily helps gain new knowledge without focus on immediate practical application or use. This distribution of funding is generally skewed towards low technological maturity ideas which could be disruptive, rather than funding continued development of incumbent products and solutions.

Figure 1 *NSIP Pilot funding by WTO Subsidy Control Category*



In the initial National and International Pilot calls, the UK Space Agency supported 15 SMEs, 5 large companies, and 8 universities who led NSIP Pilot projects. In these calls, project teams also included a total of 64 listed partner organisations. These included 28 SMEs, 13 large companies, 22 universities or other research organisations, as well as 5 government agencies. 3 organisations who were listed as partners have since dissolved (Virgin Orbit, S4, Durham Precision Optics).

Figure 2 *NSIP Pilot funded organisations split by type (including leads and partners)*



Over two thirds (69%) of project teams in the initial funding calls featured industry-research organisation collaboration (universities and other research performing organisation). In the subsequent Implementation phase, which down-selected a subset of these projects to pursue follow-on activities, this figure rises to 82%. While the overall proportion of academic-industry

[12] This counts 'down-select' projects as new projects

collaborations across projects is **not necessarily a standalone impact**, it could demonstrate greater collaboration and synergy between companies and research organisations in some cases.

Technology development

Technology development is a central aim across all NSIP calls, with a core objective of the programme being to support an average improvement in Technology Readiness Level (TRL) of two or more over the lifetime of each project.

We have limited data for TRLs in NSIP Pilot projects, especially for the original Pathfinder and International calls. This is due to this data not being captured in early reporting and documentation, and challenges in collecting data several years after the event. NSIP Pilot TRL data is more comprehensive at the Implementation level, where an internal UK Space Agency report has outlined that anticipated TRL increases have been met across the board[13].

In the initial Pathfinder call, we have starting TRL data for **6 projects, at an average TRL of 2.3**. Within this average, figures range from TRL 1-5. We have end TRL data for seven projects in the Pathfinder call, at an average **TRL of 3.7**. While the sample size is limited, this would indicate an average TRL increase of 1.4. We lack TRL data for the International call, so are limited in our assessment of these projects.

We have better data for the down-selection of projects in the subsequent Implementation phase. From a sample size of 8/11 projects, **the average starting TRL is 3.3**. The same 8 projects ended the Implementation phase with a TRL of 5.1, **leading to an average TRL increase of 1.8**. A further 2 projects have progressed into a second Implementation phase, where they are targeting a TRL increase of 3 and 4 respectively, which would take both systems to a final TRL of 8.

While it would not be robust to take the average starting Pathfinder TRL and compare it to the end of the Implementation phase, we see evidence of at least 4 projects increasing their TRL by 3 over both calls. If we assume the average starting TRL in the Pathfinder stage applies to all projects, this **would represent an average TRL increase of 2.8 across all NSIP Pilot calls**, although this also reflects the fact we have better data for the projects which progressed through subsequent stages.

Figure 3 *Average TRL start, end and increase across NSIP Pilot projects*

Beyond these overall averages, there is evidence that NSIP support has played a role in developing specific subsystems. For example, while overall TRL data is patchy, we have evidence that one project was successful in bringing three components from a low maturity up to flight-proven status. These subsystems related to image processing, ground support, and satellite tech, and were taken from early analytical studies (TRL 1, 2 and 3) up to TRL 9 status as a result of Pathfinder and Implementation funding.

A common theme in our interviews that while system-wide TRL measures provide a useful and standardised measure of technological maturity, they can also mask technological development at the subsystem level, which is often a key sign of project progression within NSIP projects.

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[13] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21* and UK Space Agency (2022) *Monitoring & Evaluation Report National Space Innovation Programme – Implementation Phase 2021/2022*

Generation of new intellectual property

While we were only able to speak with representatives from around a third of NSIP Pilot projects, stakeholders generally reported they had developed new IP in very early-stage technology development activities. In response to a UK Space Agency internal survey, 25% of projects stated that new IP had been developed. In interviews, project teams stressed that the short timeframe for projects meant they were developing informal know-how, **but these findings could underpin future development of better-defined solutions, with higher IP/patent potential**.

In a previous internal NSIP Pilot M&E survey, project teams reported that three patents were declared as 'under review' or 'pending'. Moreover, one ongoing project has stated they will register a patent attributable to the funding once project work has concluded. To date, **we have not yet found any evidence of registered patents linked to NSIP Pilot funding**. This is consistent with the UK Space Agency's internal analysis, which states that IP which project teams had anticipated registering has not materialised in the majority of cases.

This may suggest that efforts to formally protect innovation under the Pilot calls may still be under review process, or have not been accepted, or simply that plans did not materialise, as teams moved on to other activities. It may also reflect a view we heard from several interviewees that they do not intend to patent either due to reasons of cost, or perceived risk from putting potentially sensitive design details in the public domain. Finally, it could also, simply, reflect missing information.

> *"We are still in the process of applying for a patent relating to our technology, which is still under development.*

> *"We will protect our designs. We need to patent, but we have not had the time to do it yet.*

Alignment with NSS emerging sectors

The National Space Strategy has outlined a key objective to lay the foundation for UK leadership in emerging sectors, in order to "capitalise on the nascent opportunities of the future". A total of 6 emerging 'high-risk, high-reward' sectors are identified, including: in-orbit servicing, active debris removal, in-space manufacturing, space travel and habitation, space-based energy, and in-situ space resource utilisation.

Figure 4 *NSIP Pilot alignment with NSS emerging sectors*

Across the 42 NSIP Pilot projects, only **8 align with these emerging sectors**. This relatively low proportion is perhaps unsurprising, given that mapping to these sectors was not an active aim of funding decisions, and that the initial call for applications for the Pathfinder and International stages predates the publication of the National Space Strategy.

Nonetheless, there is some alignment with emerging sectors, including active debris removal in particular, and space travel and habitation to a lesser extent.

Current and future productivity benefits

Despite a relatively small sample size, we have found evidence that organisations funded under NSIP Pilot have utilised funding to improve both their physical and digital research infrastructure, which can also be used for other projects. **At least 6 premises have been upgraded or built as a result of NSIP Pilot funding**, including new clean rooms and testing facilities. Moreover, project teams have also purchased or developed new hardware and software, including ground receiver equipment, and a digital systems toolkit for complex modelling.

We heard how these upgrades not only enhance project-related activities, but can also **strengthen the capacity of funded organisations to undertake additional R&D activities in the future**. For example, project teams mentioned that new facilities are essential for testing activities at later stages of technology development, and can be utilised in in other projects.

These benefits, alongside the recruitment and upskilling of staff (discussed in more detail in Section 2.5.1), and establishing supplier and partner networks (discussed in Section 2.3.1) have the potential to have **wider productivity-enhancing benefits for the UK space sector in the long term**. As a result of the limited sample size, we have limited information on project team perceptions on the impact of NSIP funding on organisational productivity. However, NSIP Pilot projects have been regarded as **crucial enablers of future activitie**s in many cases (such as follow-on projects), suggesting company processes developed through NSIP Pilot have in many cases helped to enhance in-house capabilities.

Investment and North Star Metric outcomes

Capturing leveraged investment and in-kind contributions helps to measure the level of private sector support, informing the **UK Space Agency's principal measure of success, the North Star Metric**. North Star Metric reporting was introduced as a condition of UK Space Agency funding in

August 2022 and therefore Pilot projects predate reporting requirements, with the exception of the two down-select projects. This means our data on investment outcomes is patchy, relying in places on examples of impact.

Funded organisations were required to provide matched funding contributions, differing by organisation size and type from a 0.5 matched funding rate for large organisations to a 0.8 rate for research organisations, government entities and non-profit organisations[14]. The UK Space Agency is required to comply with the Subsidy Control Act 2022[15], which defines matched funding rates. These rates are standardised and not UK Space Agency-specific.

Across Pilot projects, funded organisations contributed a total of **£13.3m in matched funding,** with contributions varying from £0[16] to £7.5m[17] across multiple phases of funding. The Implementation call raised the most matched funding (£10m), followed by the 2020 call (£2.7m) and the International call at £500k. These differences are largely a reflection of the value of grant funding awarded.

Beyond matched contributions, funded organisations may choose to invest more of their own funds into their project or follow-on work (internal investment). We could find only **extremely limited quantitative evidence of internal investment.** This may reflect a lack of North Star reporting requirements and the time which has passed since projects were funded, leading to data collection challenges. Still, whilst project teams could not provide monetised estimates of internal investment, we have some limited evidence that internal investment did occur. One SME, for example, noted that they reinvest all their revenues. Another organisation could not put a monetary value on internal investment but explained that they had upskilled their staff, as well as improving their data centre and hardware.

We also considered external investment, which includes both follow-on public funding and private investment. Private investment is another element of the North Star Metric and includes money invested through equity, grant, prize, debt or alternative finance sources. The evidence on private investment linked to Pilot projects is inconsistent, with **many project teams not seeking to secure external investment** for a variety of reasons. For example, the Pilot funded a number of universities, for whom the focus on private investment is typically not appropriate; and commercial organisations may also choose not to pursue private investment to avoid diluting their equity stake (this was a perspective we heard in some interviews). For other project teams, the work conducted with Pilot funding ultimately did not progress further, with staff instead focusing on other more promising opportunities.

Nonetheless, there are some **strong examples of external investment**, though the attribution story is often complex. **One funded organisation went on to generate £80m ($100m) in private investment** from the US stock market, which (we heard) had a transformative effect on the company, allowing them to grow in new ways. This investment was a result of not just NSIP funding, but also an ESA project. In another example, one project team secured external investment directly as a result of NSIP funding, with their lead investor making Pilot funding a condition of investment. In total the company has generated over £40m in private investment. Pilot funding also played an important role generating external investment into the UK from Lockheed Martin, by enabling a collaboration between Lockheed Martin and Northumbria University (see case study in Section 3.2).

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[14] This means, for example, that large organisations (0.5 matched funding rate) must contribute £1 for every £1 of UK Space Agency investment and research organisations (0.8 matched funding rate) must contribute 20p for each 80p of UK Space Agency spend.
[15] Department of Business and Trade (2022). *UK subsidy control regime.* Available at: https://www.gov.uk/government/collections/subsidy-control-regime
[16] A small minority of organisations were not required to provide matched funding contributions.
[17] This project team were awarded funding through multiple funding phases.

> *By advancing the technology, we have been able to demonstrate a more tangible product to investors.*

> *I genuinely believe that [NSIP Pilot project] together with ESA funding helped us to raise $100m+ in the US stock market….while the project was unsuccessful, it has ultimately led to new revenues, exports and jobs being secured more quickly….some of the thinking in the project gave us the experience and enabled us to start conversations with private actors and other governments*

At this stage, the private sector leverage ratio[18] for Pilot projects is 0.54, meaning that for every £1 of public investment, 54p of non-public investment has been generated. Due to gaps in reporting of external investment any estimate based on real data is likely to be an underestimate, and underscores the importance of regular reporting if these benefits are to be captured.

Given we often struggled to engage with project teams due to the time which has elapsed since funding was received, we also investigated the total external investment which funded organisations have received post Pilot funding. Whilst this cannot all be attributed to the Pilot, **commercial organisations funded went on to receive nearly £200m in investment**.

For many organisations, we heard how **Pilot funding was just one element within a much larger project or company-level journey**. Pilot projects often developed from other similar grant-funded or internally funded projects. Moreover, further funding has been crucial to progressing work after their Pilot projects concluded. Shortly after project conclusion, all Pilot 2020 and International call project teams anticipated seeking further grant funding[19]. Pilot funding helped organisations to successfully bid for this "much-needed" follow-on public funding[20]. 26 unique lead organisations in receipt of Pilot funding (all calls) went on to receive further funding through other NSIP pathways (5 through ETP (all calls), 2 through Kick Starters and none received Major Projects funding). To note, one organisation was funded twice through Kick Starter and once through ETP and another organisation received ETP funding thrice under separate calls. Project teams often leveraged experience from their Pilot work both in writing the application and in delivering project work. Lastly, some funded organisations went on to receive funding through other UK Space Agency programmes. One team, for example, received £600k in International Bilateral Fund (IBF) funding, which was a direct continuation of NSIP Pilot activities.

The investment story is still unfolding for many Pilot projects, with **several projects ongoing and most technologies yet to reach market** at the time of writing and the technology or ideas developed through other projects still in development. Several project teams noted an interest in securing further investment, with at least four potentially interested in private external investment. Of those, **three project teams agreed or strongly agreed that Pilot funding has increased their likelihood of securing external investment**.

[18] This is the sum of matched funding, internal investment and external investment, divided by grant funding.
[19] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21*.
[20] Note: UK Space Agency and ESA grant funding is not included within the North Star Metric.

2.1.2 ETP projects

The Emerging Technologies Programme (ETP) has run four calls featuring different thematic focuses (as illustrated in **Table 1**), targeting projects between TRL 1-4. By focusing on this level of technological maturity, the UK Space Agency seek to provide early support for the pursuit of disruptive and radical ideas at the outset, rather than widespread commercial adoption of technologies.

Distribution of ETP funding by activity and organisation type

The UK Space Agency have allocated a total of £8.5m to ETP projects, and there are variations in the types of activities being funded between Pilot and ETP, reflecting their different objectives. While £490k was allocated to non-profit research and technology organisations (RTOs) and £2m to industrial research, the majority of funding was used for academic research (£5.6m). Unsurprisingly, this is also influenced by the organisations in receipt of ETP support – as over half of leads and partners (55%) are universities. Universities and other research organisations also lead 62% of ETP project teams overall, and even more in calls 1 and 2, where universities and other research organisations led 8/9 and 12/14 projects respectively.

Figure 5 *ETP funding by WTO Subsidy Control*

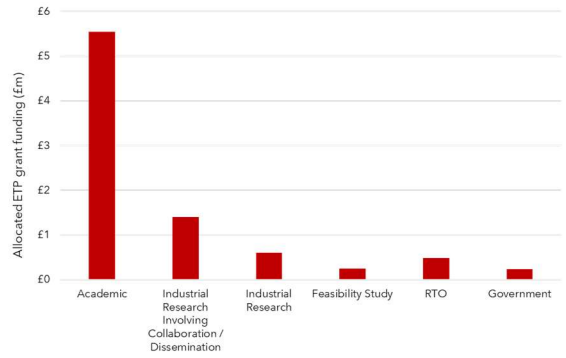
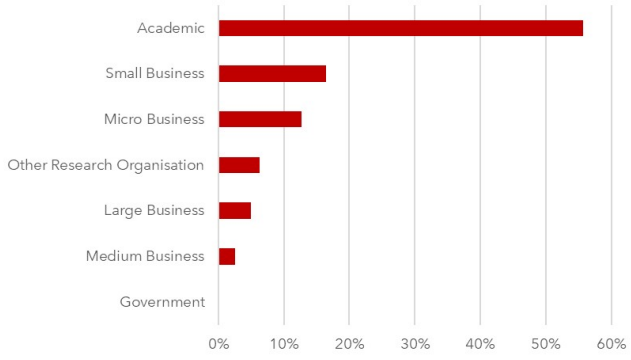


Figure 6 *ETP funded organisations split by type (including leads and partners)*



Technology development

The 41 ETP projects **began with an average TRL of 1.9** across projects, meaning that at project inception, many projects had only observed basic principles - the least mature stage of technology development (TRL 1). Others began in a slightly more advanced position, identifying practical applications of the technology, albeit without experimental proof or feasibility concepts.

Through ETP, project teams have undertaken a variety of work packages to further refine and mature technologies. These activities have included requirements analyses, design reports, experimental tests, integration analyses, hardware/software development, and roadmaps. For the 31 projects we have up-to-date TRL information for, these crucial preliminary steps have raised the current average to 3.6, supporting an **average TRL improvement per project of 1.8**. This figure is likely to increase in the coming months, given the high proportion of ETP projects which are still ongoing, or have had no-cost extensions to complete final deliverables and milestones.

Many projects, for example, have completed laboratory demonstrations, modelling and simulation activities which have raised TRLs to a minimum of 3, while others have completed system-level breadboard components (i.e. they have developed construction base to prototype parts and circuits), which demonstrate basic functionality in test environments. These tests are defined relative to the required performance in its intended operating environment. To date, we have not found evidence of ETP projects progressing beyond TRL 4. However, many stakeholders are actively exploring possibilities of in-orbit demonstrations of their technology. This would raise the TRL of their respective technologies further after their ETP project concludes, although this is dependent on follow-on funding and contract opportunities, as well as forming new partnerships.

Figure 7 *Average TRL start, end and increase across all ETP projects*

Generation of new intellectual property

The abovementioned analysis, testing, design and integration activities have enabled ETP project teams to generate new knowledge and intellectual property, which is generally regarded by project teams as 'informal' at this level of technological maturity.

Project teams held mixed views on their intentions to file for patents. Some technologies and solutions are intended to be open access, others are prioritising the generation of publications, and other stakeholders were unsure whether they would be feasible, based on costs and expected returns. Nonetheless, **at least 4 organisations** mentioned they are in discussions with licencing teams or patent attorneys to explore the possibility of patents, and **8 potential patents** have been mentioned in interviews, although they would require further scoping and technical consideration.

Across ETP projects, at least **11 digital assets** were developed through project activities. These included trained AI demonstration systems, new software, code and models. This new software is improving project teams' data processing, analysis, simulation and modelling capabilities, which have the potential to drive technological breakthroughs in the space sector and beyond. A key example of this within ETP projects are improvements in quantum key distribution (QKD) systems for secure satellite communications. We heard in interviews that developments in this area could be applied downstream to provide secure communication in terrestrial sectors, such as financial services, healthcare, cloud computing, and other critical national infrastructures.

Novel research breakthroughs

To date, ETP projects have generated new knowledge, including testing of first-of-a-kind solutions, and experimental results which have challenged the status quo within specific fields of research. Project teams have identified at least **18 research breakthroughs** across projects, which include:

- ***Successful validation of new products and techniques*** (e.g. through lab demonstrations)

- ***Integration of existing solutions in innovative ways*** (e.g. improved modelling by leveraging networks of sensors or antennae)
- ***Breakthroughs which could lead to size, weight, or power advantages*** (e.g. through miniaturisation and efficiency improvements)

Currently, given the relatively low maturity of the technologies and solutions developed through ETP, these research breakthroughs have not translated into disruptive commercial solutions yet, and have had limited impact on the industry status quo. While crucial early progress has been made towards this objective, project teams highlighted that **further funding, technology development and commercialisation efforts will be necessary to realise commercial benefits such as revenue or increased market share**.

Alignment with NSS emerging sectors

As mentioned above, HM Government have identified 6 emerging opportunity sectors, where early stage technology development could help to give the UK a competitive advantage. With ETP targeting low starting TRLs, projects are typically a long way from capturing market share, but this mapping illustrates the markets which ETP funding may influence in the long term, if continued financial support is secured and commercialisation activities continue.

Figure 8 *ETP alignment with NSS emerging sectors*

Relative to NSIP Pilot, the 41 ETP projects have closer alignment with the NSS emerging sectors. For instance, 13 projects are developing technologies applicable to space travel and habitation, while 10 are applicable to in-orbit servicing.

There are two key reasons for this closer alignment with the NSS emerging sectors. Firstly, the ETP calls followed publication of the NSS, making emerging sectors more likely to be considered as part of the strategic fit. Secondly, ETP included domain-specific calls, such as space instrumentation and space debris mitigation, for example, which align closely with these emerging sectors.

Current and future productivity benefits

Through ETP, project teams have utilised funding to improve their in-house capabilities. For instance, **6 projects have leveraged funding to directly improve their facilities**, such as vacuum chambers, new machining tools, and testing infrastructures. While these facilities may be essential to delivering ETP work packages, they also strengthen the capacity of funded organisations to undertake additional R&D activities in the future.

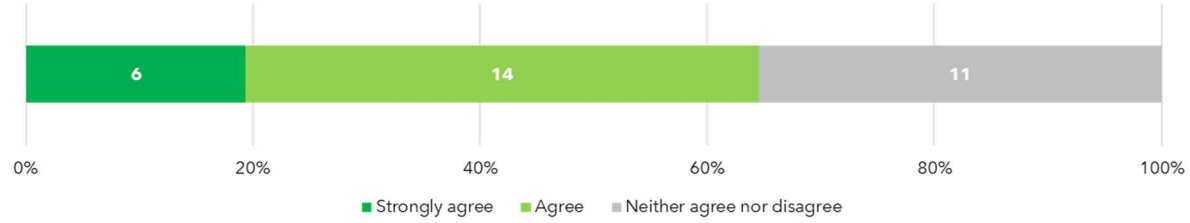
Other ETP project leads have formed partnerships with organisations that offer complementary capabilities (e.g. companies with critical advantages in specific components, unique testing or manufacturing capabilities, or expertise in a specific field/application). By further developing these collaboration networks, funded organisations have improved their access to expertise and research infrastructure essential for assembly, integration and testing of novel concepts and solutions. While it is too early to tell whether these partnerships will continue beyond the duration of the projects, these networks could be leveraged in the future to support future commercialisation of technologies and services developed through ETP.

As a result of developing new in-house capabilities, forming new partnerships, and recruiting / training staff (discussed in more detail in Section 2.5), **two thirds (20, or 65% of respondents) of ETP lead and partner organisations agreed that ETP has already directly improved their organisation's productivity**, with several respondents noting that new capabilities and processes developed through ETP could be applied to other projects.

A further 11 organisations reported a neutral response to the impact of funding on their productivity levels, with many of these organisations stating that it is **too early in the process for productivity benefits to be realised**. For example, some organisations stressed that 'state of the art' technology development is less concerned with efficiency and productivity improvements, although some recognised that these activities could enhance productivity in the future.

> *Because the technology is brand new, it is not about improving efficiency and productivity right now. These are initial stages which should help us become more productive and efficient in the long run, compared to the current state of the art.*

Figure 9 *Respondent perceptions on whether ETP funding has improved their organisation's productivity*



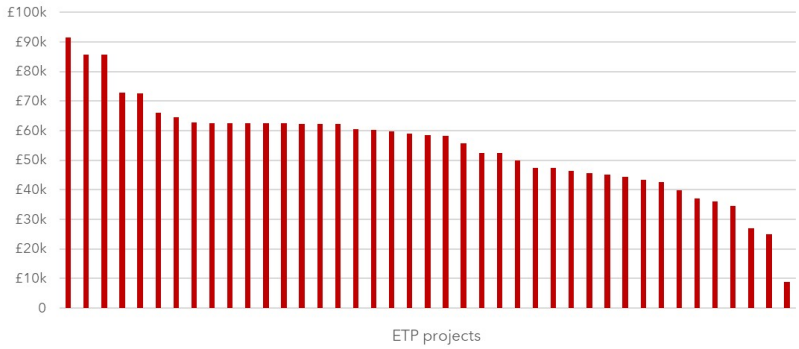
UK Space Agency support for ETP projects has also allowed project teams to **explore potential use cases for the technologies and services** being developed under the programme, e.g. through 'road mapping' work packages. While these are relatively early-stage concepts, project teams have mentioned potential spin-off applications in both space and terrestrial markets, which could be explored in future work. These are discussed in more depth in Section 2.4.2.

Investment and North Star Metric outcomes

Given ETP is aimed at low TRL projects, we would expect the largest external investment outcomes to accrue in future years, when technologies have reached higher maturity and are hence less risky for private investors. A minority of projects have received private investment, but many more are looking for further public funding in the first instance, to bringing technologies developed closer to market. This relatively low current appetite for private investment also reflects the high concentration of academic institutions funded through ETP, which often do not seek private investment and are able to contribute relatively little in internal funds.

ETP projects were subject to standard UK Space Agency matched funding requirements, with project teams contributing a total of **£2.2m in matched funding**, compared to total project costs of £10.7m (21% of overall costs across projects). This relatively low matched funding total is a consequence of the organisational make-up of project consortia, with many academic institutions funded, who are subject to a 0.8 matched funding rate. Matched funding totals were similar across ETP calls, with Call 1 raising £530k, Call 2 £640k, Call 3 £590k and Call 4 £480k, though there is significant variation between individual projects.

Figure 10 *Matched funding contributions by ETP project*



Beyond matched funding contributions, several project teams have invested their own funds as a result of ETP, with far greater internal investment expected in future. So far, we have evidence of at least **£1.5m in internal investment**, with £1m of this coming from one organisation, for whom the ETP project gave them the confidence to invest in capital equipment. In a smaller scale example, one organisation received £10k in investment from within their organisation to explore the terrestrial applications of the technology. They are now applying for further grant funding to pursue this activity. Beyond these monetised examples, several project teams noted **internal investments which they struggled to quantify** including staff time, new equipment and access to new lab space.

It is early days for internal investment, with most projects ongoing and therefore covering current activities within project costs. We expect the largest internal investment to accrue once projects have concluded. Since North Star Metric reporting was introduced as a condition of UK Space Agency funding in August 2022, we only have data on investment expectations for ETP Calls 2-4. Still, these teams forecasted at application stage that they would generate **internal investment of £5.8m over the first 6 years** from initial funding (roughly FY2023/24 to 2028/28, depending on the project). At this early stage, project teams appear on track to realise these internal investment expectations - see Section 4.3 for a comparison.

Similarly to internal investment, project teams projected strong external investment, but realised investment to date is low. Across calls 2-4, ETP teams forecasted **£63m in external investment over the 6 years from initial funding** (roughly FY2023/24 to 2028/28, depending on the project). To date, we have evidence of just **£2.7m in external investment**. This low total is partly a reflection of reporting, with several organisations noting that they had received external investment, but not willing to share the amount. This is a common issue in North Star Metric reporting, with organisations hesitant to share the details of commercially sensitive deals. However, beyond gaps in reporting, funded projects are at an early stage of technology development, where **investing is inherently risky**. One project team noted that they might see external investment within two years, when their technology is more reputable and market-ready.

Still, there are ETP-funded organisations actively pursuing private investment at the time of writing. One company, who also received funding through the NSIP Kick Starter, laid out ambitious plans for securing external investment at proposal stage. Whilst plans have been delayed, the company is interested in VC funding, potentially through a space accelerator. They aim to generate £500k in

seed funding by autumn 2025 and a further £2m in subsequent funding. We heard how **the investment story is "only just starting"** for several organisations funded through ETP. In future, it will be useful to compare external investment expectations with realised outcomes.

At this stage, the private sector leverage ratio for ETP projects is 0.71, meaning that **for every £1 of public investment, 71p of non-public investment has been generated**, mostly as matched funding. This is largely a reflection of the early-stage status of most projects. We would expect this ratio to increase once projects have completed, though the relatively high number of academic organisations funded through ETP will likely limit the extent of private sector leverage, compared to other NSIP pathways.

Project teams were generally more focused on securing further grant funding than private investment. Across projects, we heard how there are at least **14 ongoing discussions around securing investment**, of which most are linked to future grant opportunities, including several discussions ongoing with ESA. These conversations could – we heard - lead to further public funding of at least £3.8m[21], of which the vast majority is expected to come from two large grants from ESA and UKRI. Several organisations have already received further public funding which can be at least partially attributed to their ETP projects. One organisation explained that the knowledge they generated through their ETP project allowed them to successfully apply for CEOI (the Centre for Earth Observation Instrumentation) funding. NSIP Pilot funding supported one organisation in de-risking and enabling parallel technologies, which contributed to them securing funding through the International Bilateral Fund. Another consortium funded through ETP is being funded again as a successful partnership by ESA to investigate another application of their technology.

2.1.3 Counterfactual

In a scenario without ETP funding, it is clear from our evidence collection that the UK would not have seen the same level of technology development and TRL raising, if it was to occur at all. We heard from several stakeholders that **ETP filled a crucial gap in the funding landscape**. A quarter (6/24) of ETP project teams we interviewed were confident that their project would **not have gone ahead at all**, while two thirds (16/24) said they would have looked for **alternative sources of funding**. Some project teams mentioned alternative funding sources (e.g. ESA, UKRI, DSTL, CEOI), but felt these opportunities were less suited to their project objectives and starting TRLs, and would have had to change project scope to meet application requirements. This view is reinforced by the unsuccessful ETP applicants, as **all unsuccessful applications have either not gone ahead at all (3/11 projects) or have changed scope and experienced significant delays (8/11)**.

For NSIP Pilot, the UK Space Agency internal M&E report similarly states that **all funding recipients felt Pilot funding had enabled them to undertake innovation which would otherwise have been delayed or not happened at all[22]**, indicating strong additionality. The level of TRL increases is also likely to be influenced by continued NSIP Pilot funding (e.g. Pathfinder through to Implementation. Like ETP, this view of NSIP Pilot funding is reinforced by one unsuccessful applicant, who estimated that not receiving funding slowed their project down by between 12-18 months.

Where there are large investment outcomes, attribution is complex. While NSIP Pilot funding is mentioned as a key factor in securing investment, organisations have often received funding or financial support from other sources. While additionality is partly limited due to this, we heard from

[21] This funding is still subject to final decisions.

[22] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21* and UK Space Agency (2022) *Monitoring & Evaluation Report National Space Innovation Programme – Implementation Phase 2021/2022*

stakeholders that there were examples of a direct link between NSIP Pilot funding and private investment. For instance, in the views of one stakeholder:

> *One investor had a condition that UK Space Agency NSIP [Pilot] funding was gained before private investment could be finalised*

For ETP, the majority (13/15) of projects noted that UK Space Agency funding had **increased the likelihood of securing external investment**, although as mentioned previously, limited amounts have materialised to date. This is to be expected, as ETP is aimed at low starting TRL technology, and further funding is expected to be required before securing significant levels of investment.

2.1.4 Emerging themes

Both NSIP Pilot and ETP have primarily supported projects with low initial technological maturity, focusing on novel, high-risk, high-reward solutions. NSIP Pilot has provided support to diverse stakeholders, including large companies, SMEs, academia, and research organisations. ETP, in contrast, has (relatively) concentrated support for universities (and small organisations to a lesser extent).

Across multiple funding rounds, both NSIP Pilot and ETP have supported TRL raising of technologies. Projects have tested, integrated and de-risked technologies, generally reaching mid-level technological maturity (around TRL 4 to 5), with some exceptions. For NSIP Pilot, we have patchier data for the Pathfinder call, but have identified an average TRL increase of 1.4. In the Implementation (phase 1) call, 8/11 projects had an average starting TRL of 3.3, and an average end TRL of 5.1, indicating an average rise of 1.8. Implementation phase 2 is expected to lead to further increases, with both projects targeting TRL 8. We lack data to analyse TRL for International call projects.

For ETP projects, TRL levels have so far increased by an average of 1.8 (across 31 projects), although many are still ongoing, meaning these averages are likely to increase in the future and **appear on course to meet the wider NSIP aim of a TRL increase of 2**. Despite this progress, neither call has yet significantly disrupted the industry status quo (though nor would it have been expected to). These technologies will require follow-on testing, demonstration, and commercialisation activities before reaching market.

Funded organisations across both calls have developed informal IP throughout project activities, and ETP projects in particular have led to strong digital asset creation – providing evidence of improved data processing, analysis, simulation and modelling capabilities. While some organisations have expressed desire to patent their technologies, we have found no evidence of formally registered patents across either call to date. While this could be due to several reasons (e.g. they have not materialised, limited information, time lag between application and granted patents), some project teams feel cost and secrecy are barriers to patenting their technologies.

ETP funding has also led to at least **18 research breakthroughs**, which encompass validation of new techniques, integration of systems in novel ways, and improved size, weight, power or performance relative to incumbent solutions. This trend has not been witnessed in the NSIP Pilot to the same extent, though this could be a reflection of the lower sample size, evidence gaps, and the fact there is a higher proportion of academic organisations in ETP, who are potentially more likely to declare a new development as a 'research breakthrough'.

Evidence suggests NSIP Pilot and ETP funding have had **positive impacts on the productivity of funded organisations**. For instance, projects in both calls have contributed to enhancing UK R&D

infrastructure – primarily through upgrading and establishing new facilities, but also by developing and purchasing new hardware and software. Moreover, by fostering partnerships, project teams are well positioned to undertake follow-on development opportunities, or leverage these new networks to pursue additional opportunities.

NSIP Pilot has generated much larger matched funding contributions than ETP, partly due to differences in grant sizes, but also the higher proportion of academic organisations in ETP and the nature of the research being conducted. Beyond match funding, our **evidence on Pilot investment outcomes is patchy**, but there are strong examples of impact (e.g. one firm raised £80m, which can partly be attributed to NSIP). For ETP, we have more consistent monitoring of investment outcomes, but impacts are limited at this stage given projects are often still ongoing. Additionally, most ETP teams are currently focused on securing public funding given their low TRL focus and a feeling that they are not yet 'investment ready'.

While the impact story across both NSIP Pilot and ETP is still unfolding over a longer timescale, there is a positive trajectory for innovation impacts at this stage, notwithstanding some evidence gaps for NSIP Pilot projects. We will revisit these emerging impacts and evidence gaps in our final evaluation of NSIP Pilot and ETP in 2026.

2.2 Scientific and societal

While NSIP's core aims relate to technology development, innovation and capturing market share, technologies developed through the programme could contribute towards other key UK Space Agency objectives. Advancing **scientific knowledge and leveraging space technologies to address societal challenges** are central objectives of the HM Government's National Space Strategy. For example, Goal 3 of the strategy aims to 'lead pioneering scientific discovery and inspire the nation', highlighting clear ambition to build and sustain a strategic advantage in science and technology.

Goal 5 aims to 'use space to deliver for UK citizens and the world', underlying the crucial role of space technologies in tackling global challenges, including climate change, biodiversity loss, and national security. Furthermore, Goal 5 expresses a commitment to use space to deliver the UN Sustainable Development Goals (SDGs). To achieve these goals, the strategy also emphasises the role of a whole-UK space ecosystem, which ensures the space economy works for all parts of the UK.

Summary of key findings

- **Alignment with development goals** – ETP and NSIP Pilot projects closely align with UN Sustainable Development Goals related to innovation, collaboration and economic growth.
- **Climate and space sustainability** – the two funding streams display complementary focuses, with ETP projects largely geared towards space sustainability (59% of ETP projects applicable, using a broad definition of space sustainability, versus 15% NSIP Pilot projects), while NSIP Pilot activities are more applicable to climate change objectives (70% of NSIP Pilot projects applicable, versus 15% ETPs).
- **Dual-purpose potential** – at least 23 projects across ETP and NSIP Pilot have dual-use applications.
- **Publications** – ETP projects reported a modest research output so far, with 15 published papers and another 17 in development, while NSIP Pilot projects reported publishing 3 papers. Citation impact is similarly limited so far, but will take time to accrue. Ultimately, we have not seen evidence yet of a strong story with regards to scientific impact.
- **Geographical distribution of funding** - funding from both streams is relatively concentrated in the South East, followed by Scotland.

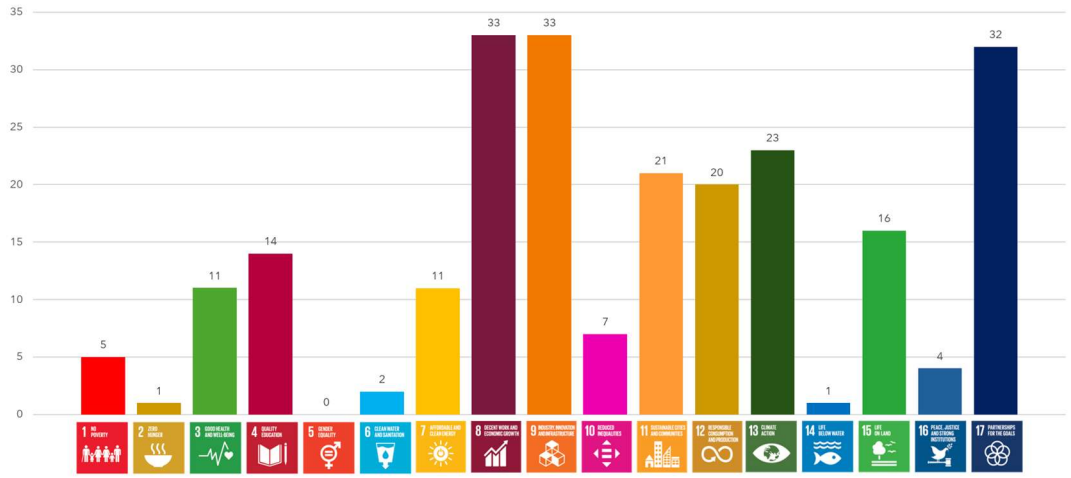
2.2.1 NSIP Pilot projects

Potential contributions to priority global challenges

In order to assess the progress of NSIP Pilot projects in tackling priority global challenges, we have mapped projects based on their direct applicability to the United Nations SDGs. The SDGs provide a framework of 17 global goals, used to address the world's most pressing challenges. While NSIP Pilot projects do not necessarily prioritise these aims, by mapping the long-term objectives of NSIP Pilot projects, we are able to identify the **global challenges which NSIP Pilot projects may contribute to addressing** over the long term.

Each NSIP Pilot project is closely linked to at least four SDGs, with seven projects addressing 10 or more goals, indicating a broad distribution of efforts across development areas. Goals 8 (Decent Work and Economic Growth), 9 (Industry, Innovation, and Infrastructure), and 17 (Partnerships for the Goals) received the most attention, with more than 30 projects contributing to each. As expected, **NSIP Pilot projects reflect a strong focus on economic growth, innovation, and collaboration**. In addition, around 20 projects produced research applicable to goals 11 (Sustainable Cities and Communities), 12 (Responsible Consumption and Production) and 13 (Climate Action).

Figure 11 *Number of NSIP Pilot Projects with research applicable to each UN SDG*



Potential applications for tackling climate change

With strong links to SDG 13 (Climate Action), a high proportion of NSIP Pilot projects are focused on addressing climate change through the development of space technologies. Indeed, **70% of NSIP Pilot research activities are relevant for efforts to tackle climate change** or its consequences, such as increased flooding. This figure is considerably higher than other pathways within the NSIP programme (e.g. Kick Starter projects, Major Projects, and ETP), with an overall programme average of 39%. This is to be expected, considering the NSIP Pilot call directly prioritised projects in one of its two themes, on earth observation to tackle climate change.

The NSIP Pilot provided financial support for organisations to pursue hardware and software development to improve climate change monitoring capabilities. These included projects focused on maturing accelerometers, sensors, imaging payloads, AI tools, and data processing infrastructures, to improve the resolution and operating rates of space-based climate and environmental data.

While the primary objective for the projects may have been maturing technologies through testing and demonstration, they are being developed for specific use cases, often relating to measuring, mapping and monitoring the causes and effects of climate change and biodiversity loss. Specific examples include monitoring levels of greenhouse gases, deforestation, building heat emissions/insulation, maritime emissions, and water supply infrastructure. However, we have limited evidence on what the ultimate impact of the projects has been to date.

Another useful indication of environmental impact is the number of funded organisations identified by Beauhurst – a dataset of all UK private companies - as having positive environmental accolades. This data assesses company contributions to green transport, clean and renewable energy, green

buildings and infrastructure, and sustainable food production, alongside other factors[23]. This data is however not directly attributable to NSIP funding, and is not self-reported by companies.

Our analysis of environmental signals across NSIP Pilot participants reveals that 12 companies out of 20 identified in the dataset have recorded clear environmental impacts. These include achievements such as environmental accolades, advancements in clean and renewable energy, and green infrastructure initiatives.

Social and governance impacts in funded organisations

Within the Beauhurst dataset, we can also monitor the number of companies who have been flagged for positive social and governance impacts. These impacts can include gender equality in pay and representation of senior staff members, positive age diversity of directors, and prioritisation of operations with a strong 'social impact' focus.

The number of companies allocated positive social impact focus is relatively low within Pilot projects, at around 10%. Of those which were given accolades, these impacts primarily related to gender equality and age diversity of directors. Of course, this is a relatively narrow indicator of social impact at the organisation level, and excludes universities and other research institutions from the analysis. We include it solely as evidence of some funding recipients having this positive social impact recognition.

Projects applicable for ensuring space sustainability

NSIP Pilot activities show limited alignment with space sustainability objectives, with **15% of projects developing technologies and services that directly contribute to space sustainability goals**. This is significantly lower than the programme-wide average of 39%, again likely reflecting the EO and communications targeting of calls. However, some of the technologies being developed have the potential to improve orbital interactions, which could, in turn, help reduce the risk of collisions. As these projects progress, they may contribute to advancing space sustainability objectives in the future.

Projects with defence, security, or dual-purpose applications

While not the primary objective of NSIP Pilot projects, **at least 8 technologies or sub-components being developed through NSIP Pilot have potential dual use applications**. These technologies in turn have potential to support another priority challenge, ensuring national security and resilience to external threats, primarily through potential provision of secure satellite communications and high-resolution earth observation imagery. Considering our relatively small sample size of respondents, this number may be considerably higher in reality.

While further details cannot be disclosed for security reasons, at least two projects funded under NSIP Pilot are engaging with defence actors for alternative applications of their technologies.

Supporting academic research

> *The outcome story of our Pilot funding is solid – the knowledge we developed went on the provide maps for the Australian floods a couple of years ago. [As a result of not receiving follow-on funding] We haven't been able to get traction in the UK, though.*

[23] *The Definitive ESG Dataset is* available at: https://www.beauhurst.com/blog/the-definitive-esg

Our evidence of scientific publications which have been released as a result of NSIP Pilot is relatively limited, as we have only been able to speak with around a third of project teams. Moreover, NSIP Pilot projects are generally more concerned with technology development, integration and testing, rather than publication of research, which may also come into conflict with maintaining trade secrets and informal intellectual property developed during projects.

To date, we only have evidence of **three publications** which were developed as a result of NSIP Pilot funding, two of which have come from the same project. Despite the limited sample size, these publications have had modest impacts on the scientific community, with two of the papers amassing a combined 48 citations (36 and 12 respectively). These publications were published in *Nature Communications* and *Nature Portfolio* journals, which are two highly influential peer-reviewed journals with a global audience. While we lack citation data for the third publication, we heard that it was developed by a PhD student, and received attention from MIT and NASA in the US, who are now pursuing these sensors in future mission ideas.

Local growth

In order to assess how NSIP Pilot funding and the employment impacts associated with it are distributed across the UK, we analysed the spread of funded organisations, grant funding, and jobs created and supported across the UK. We note that geography was not a factor in the project selection process.

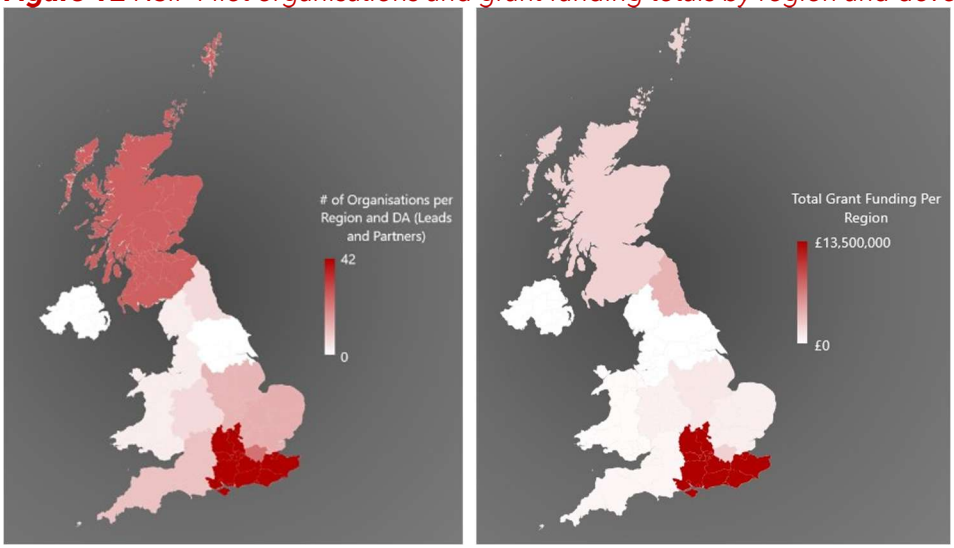
We have categorised data using the International Territorial Level (ITL) 1 classification system, which comprises 12 statistical subdivisions of the UK, including the devolved administrations of Wales, Scotland, Northern Ireland, and 9 regions of England. ITLs are standard geographical boundaries which are used by the Office for National Statistics (ONS).

As illustrated in **Figure 12**, funded organisations are relatively **concentrated in the South East**, where **£13.5m of funding (of the £28.1m total)** was allocated across the NSIP Pilot calls. This high concentration of funding is driven largely by the £8.3m allocated to one organisation, across the initial Pathfinder call, as well as two subsequent Implementation phases. This is **followed by London and Scotland**, where just over £2m (each) was allocated. For context, these three regions comprise 48% of the UK space sector, as measured by the number of sites (comprising of the South East at 22%, London at 18%, and Scotland at 8%)[24].

Northern Ireland did not receive any support through NSIP Pilot, and Wales, the North West, and Yorkshire and the Humber received minimal financial support (all less than £220k).

[24] London Economics, 2024. *Size and Health of the UK Space Industry 2023*. Available at: https://www.gov.uk/government/publications/the-size-and-health-of-the-uk-space-industry-2023/size-and-health-of-the-uk-space-industry-2023#industry-composition

Figure 12 *NSIP Pilot organisations and grant funding totals by region and devolved administration*



2.2.2 ETP projects

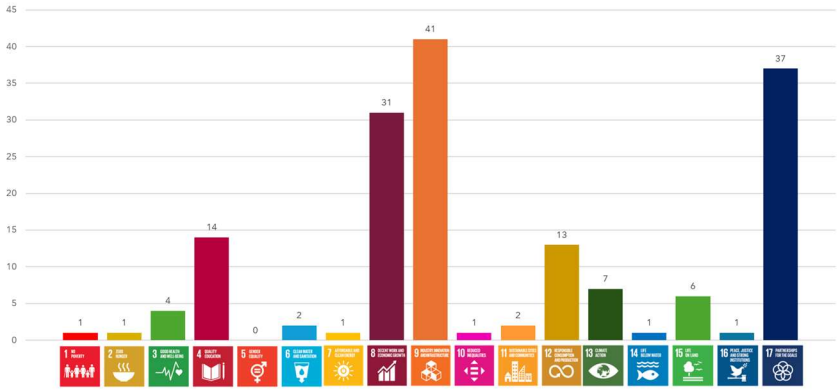
Potential contributions to priority global challenges

As mentioned above, mapping the objectives of NSIP Pilot projects to the UN SDGs is a useful process for identifying the **global challenges which NSIP Pilot projects may contribute to addressing**. Each ETP project contributes to at least one of the UN SDGs, indicating a broad alignment with global sustainable development objectives. Contributions are unevenly distributed across the goals, as observable in **Figure 133** below, which in some cases reflects the objectives of ETP. For instance, ETP Call 3's focus on EO for sustainable practices highlights potential pathways for significant contributions to several of these goals.

A significant concentration of projects aligns with SDG 9 (Industry, Innovation and Infrastructure), with 41 projects supporting economic development and technological progress. Similarly, 37 projects contribute to SDG 17 (Partnerships for the Goals), emphasising collaboration as essential for achieving sustainable development, and 31 projects align with SDG 8 (Decent Work and Economic Growth). On the other hand, as for NSIP Pilot, no ETP project addresses SDG 5 (Gender Equality). SDGs 1 (No Poverty), 2 (Zero Hunger), 10 (Reduced Inequalities), 14 (Life Below Water), 16 (Peace, Justice, and Strong Institutions) are addressed by only one project each.

In addition, we found evidence of one project establishing a cooperation with a developing country as a result of NSIP, leading to a follow-on opportunity for knowledge exchange. This is going to provide a South African University with access to 3D metal printing technologies available in the UK, with the objective of opening the door for future cooperation opportunities.

Figure 13 *Number of ETP Projects with research applicable to each UN SDG*



Potential applications for tackling climate change

Compared to the NSIP Pilot, ETP activities are relatively less focused on addressing climate change, with **less than 15% of ETP projects relevant for this goal**. Specifically, only six projects across all funding calls are conducting research that could address climate change: two in Call 2, one in Call 3, and three in Call 4. It is worth noting that while ETP Calls 4 had no thematic constraints, Call 2 focused heavily on disruptive space technologies. Call 3, however, targeted (among broader objectives) EO for sustainable practices, which offered more direct alignment with climate objectives.

While climate impact is not a primary focus of most ETP projects, some do show potential in this area. For example, one Call 1 project focused on forecasting space weather events could contribute to improved EO resolution, enabling better pollution tracking and agricultural planning. Another promising example from Call 3 is a project contributing to accelerating the transition away from hydrazine, shifting towards less toxic propellants for use in spacecrafts and launches.

As mentioned above, we can also use Beauhurst to monitor companies which have been recorded as having positive social impacts. Again, this data is not attributable to NSIP funding, and is not self-reported by project teams. Data coverage is relatively limited for ETP, given the high proportion of academic and other research organisations (48 in total) which are not captured in the database. However, of the 29 funded companies (including leads and partners) **under ETP, 41% are listed by Beauhurst as having positive environmental impact signals, much higher than in other NSIP funding streams**. Of these organisations, many had been attributed environmental accolades relating to their company activities, and one organisation has also been highlighted for positive impacts related to green infrastructure development and sustainable farming or food production.

Social and governance impacts in funded organisations

We also monitored the performance of ETP funded companies in terms of social and governance impacts. Through Beauhurst data, we observed that **17% of all ETP lead and partner companies are reported as having social and governance impacts.** These impacts primarily relate to positive age diversity and gender equality at the director level. This excludes the high proportion of academic organisations funded under ETP, of which many are likely to be prioritising positive social impact through research relevant for tackling social challenges.

Though we have a limited sample size, from available data we have identified a significant gender imbalance of project team members through survey data. As reported by project leads, 81% of team members are male, 19% female, and 0% 'other', from a total sample size of 64 individuals. While not a positive finding, these percentages are roughly in line with the UK space industry more broadly – with the latest Size and Health of the UK Space Sector report stating 75% of individuals within the sector were male, 23% were female, and 1% were 'other'[25].

In terms of the age profile of project team members, ETP supports a diverse spread of individuals. 25% of project team members were under 25 (see Section 2.5.2), with 27% aged between 25-35 and 36-50 respectively, and 21% were aged above 50.

Projects applicable for ensuring space sustainability

ETP projects show **strong applicability of activities towards space sustainability objectives**, with **59%** of projects developing relevant technologies. This is substantially higher than the NSIP-wide average of 39%, suggesting that ETP activities tend to be more applicable to space

[25] London Economics, 2024. *Size and Health of the UK Space Industry 2023*. Available at: https://www.gov.uk/government/publications/the-size-and-health-of-the-uk-space-industry-2023/size-and-health-of-the-uk-space-industry-2023#industry-composition

sustainability objectives compared to Pilot projects. This is likely due to the nature of ETP calls, with one specifically targeting space debris mitigation measures, which encouraged the involvement of industry players whose expertise is inherently linked to sustainable practices in space.

Examples of ETP's space sustainability contributions highlight the calls' diverse impacts. For instance, ETP Call 3 is funding the development and TRL raising of an active refuelling interface intended to support UK-led refuelling missions, with potential to standardise refuelling practices in orbit. Another project under ETP Call 2 is improving sensors for autonomous in-orbit operations, a capability that will guide future exploration missions and advance close proximity operations – a crucial area for space science and sustainable mission planning.

The benefits of these projects extend further, enabling advancements across the In-orbit Servicing and Manufacturing (ISAM) market. For instance, two ETP-funded projects (from Calls 1 and 4) focus on in-space manufacturing, a field with transformative potential for future space missions and infrastructure in markets potentially worth billions in coming years.

Projects with defence, security, or dual-purpose applications

Approximately **30% of ETP-funded projects show potential for dual-use applications**. In two instances, funding recipients have attracted interest from defence customers, exploring these potential applications in emerging conversations. This aligns with the versatility seen in many ETP-supported technologies, which serve as enablers for diverse applications.

For example, technologies under development related to Light Detection and Ranging (LIDAR) have significant potential in defence, given LIDAR's critical role in sensing and situational awareness. However, some projects may require modifications to meet defence-specific needs. One example is an engine technology under development that could have applications in defence. However, we heard that this currently lacks the manoeuvrability essential for this sector, suggesting that further adaptation would be required for practical use.

Supporting academic research

Across all calls, ETP has funded a high proportion of universities. While the emphasis of projects is primarily on technology development and maturation, UK Space Agency support across the 4 ETP calls is also leading to new publications, as researchers publish their project findings and outcomes of testing and integration activities. **A total of 15 papers have been published to date, with a further 17 in development.** The high number of publications currently being written or progressing through review stages reflects the ongoing nature of many ETP projects, as well as the time lag associated with publications progressing through peer review and being published.

We have limited evidence of citation impacts at this stage. A total of **eight citations have been recorded** on the above publications to date. This is not unexpected, as citations typically take around two years to accumulate following publication[26], given the time lag associated with other researchers reading the publication, carrying out their own research, writing the citing publication, progressing through peer review, getting accepted by a journal, and then being published.

Publication of research findings is not an objective for all projects, as this may come into conflict with trade secrets and protecting informal IP gained in the technology development process. However, with project teams planning to publish future research findings, there is potential for additional scientific impact, although limited citation impacts have materialised to date.

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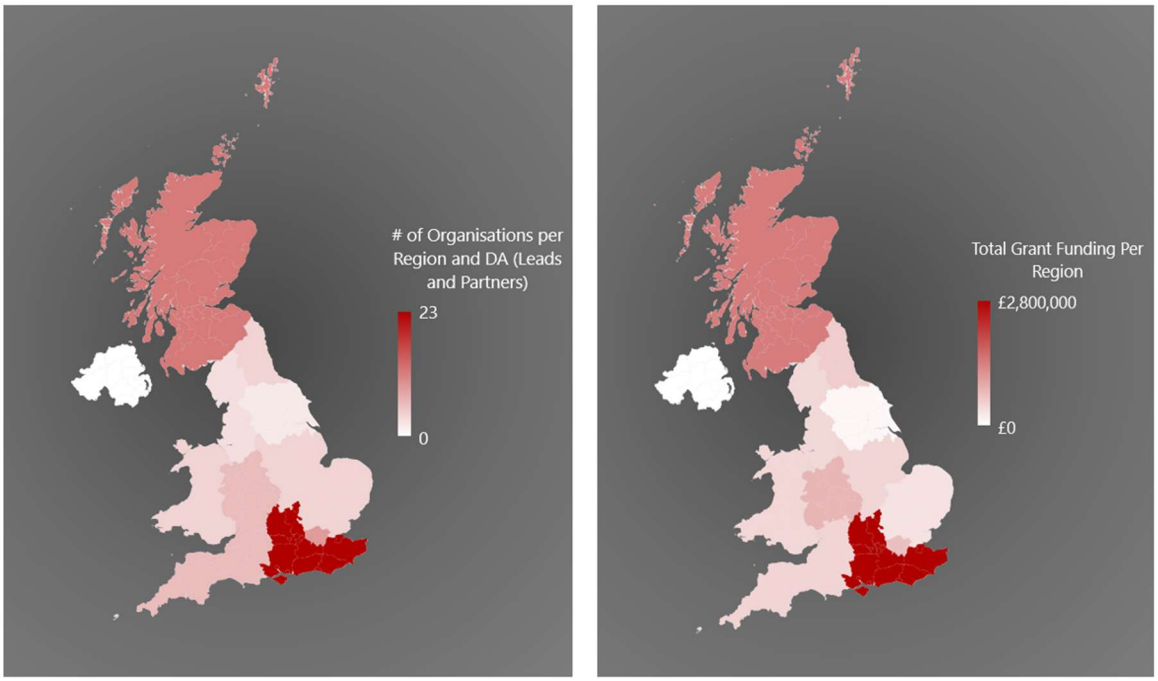
[26] Dimensions.ai (2022) *What is the FCR? How is it calculated?* Available at: https://dimensions.freshdesk.com/support/solutions/articles/23000018848-what-is-the-fcr-how-is-it-calculated-

Local growth

Like the NSIP Pilot, ETP funding is relatively concentrated in the South East, with £2.8m (32% of the total) allocated to organisations within the region. Scotland has received the second most grant funding allocated through ETP, at £1.4m, followed by the West Midlands at £800k.

Figure 14 *ETP organisations and grant funding totals by region and devolved administration*



2.2.3 Counterfactual

Project teams funded under ETP and NSIP Pilot bring prior expertise and experience relating to addressing these challenges, and UK Space Agency financial support is only one part of a wider story. However, NSIP Pilot projects we spoke to were **unanimously of the view that NSIP had led to technological development which would otherwise not have happened**, bringing projects closer to tackling the priority challenges relevant to their long-term project objectives. For ETP projects, a similar story is seen, with project teams stating that even if they were able to secure alternative funding sources, they would be beholden to the scope of these opportunities, and may not have developed technologies in the same direction.

While peer-reviewed publications arising from NSIP Pilot funding are limited in number, authors have acknowledged the key role of NSIP Pilot funding as key in supporting these publications, which have been published in high-impact journals. While not necessarily a priority of the programme, there is high additionality in the evidence we have of (limited, to date) scientific impact. With high levels of support for universities through ETP funding, the current and expected output of publications is highly attributable to funding. While it is likely researchers would have published in other fields if they were not working on ETP projects, we view that there is high additionality in the sense that from the evidence we received, the research areas in question would not have been pursued in the same way or, often, not at all.

Some additional insight on the counterfactual comes from projects who were initially successful in the 2020 call, but who then were unsuccessful in securing further Pilot or ETP funding. For example, one project representative noted that while the original pilot funding developed some

valuable new knowledge, it ended up being developed and applied (with positive social impact) in Australia rather than the UK. As such (in their view), prospective benefits to the UK were lost.

2.2.4 Emerging themes

Across the NSIP Pilot and ETP funding streams, several recurring themes emerge, revealing both commonalities and contrasts. It is important to keep in mind that **stakeholder engagement levels varied significantly between the two streams**, with 90% of ETP teams across all four calls participating in consultations, compared to 42% of NSIP Pilot project teams. This difference in engagement should be considered when interpreting the findings.

When mapping project activities against the UN SDGs, both streams show **strong alignment with goals related to innovation, collaboration, and economic growth**. Geographically, the distribution of funding reveals a concentration in the South East, followed by Scotland.

Regarding climate change and space sustainability, the two funding streams display complementary but opposite focuses. ETP projects are largely geared toward space sustainability, with 59% contributing to these objectives, while only 15% address climate change. In contrast, NSIP Pilot projects show substantial contributions to climate change objectives, with 67% of projects focused on this goal, but only 15% on space sustainability. This complementary focus suggests that the two funding streams together could address a broader set of environmental challenges.

In terms of dual-use applicability for defence, we identified at least 7 NSIP Pilot projects and 15 ETP projects with potential relevance. Academic research impacts also varied between the two streams, with NSIP Pilot projects publishing only 3 papers, while ETP projects reported more robust research output, including 15 published papers, another 17 in development, and 8 citations to date. As research citations and publications naturally build over time, this area will require continued monitoring for a more comprehensive assessment in the final report.

Ultimately, however, much of the analysis we were able to do on this topic is focused on descriptive analysis on projects' aims and the distribution of funding. While there have been some publications – at least 18 so far with another 17 in development – **we have not heard or seen evidence yet of a strong story of scientific impact**. Reasons for this may reflect the long timescales to impact, the need for realism to be kept in mind when considering the impact of TRL1-4 focused programmes, or simply that scientific impact is **not a core programme objective**. This said, many of the routes to impact can be 'softer' as ideas are developed and progressed – publications are a flawed indicator of research quality, and the qualitative narrative is in many ways more important. Many project teams were keen to stress that funding has helped them to create new knowledge that is still (in the words of one interviewee) "in the process of being developed into "real-world solutions". These impacts will therefore be important to continue to track over the longer term.

2.3 UK competitiveness and reputation

Improving the **international competitiveness and reputation** of the UK space sector is a key HM government objective, as set out in the National Space Strategy. This goal is focused on promoting the values of Global Britain, through demonstrating **international leadership and influence**.

Summary of key findings

- **Total partnerships and collaborations –** across both pathways, only 13 of the 83 total projects (15%) were delivered without partner organisations, with 11 of these being ETP projects.
- **New and strengthened partnerships –** in total, project teams report that 68 partnerships have been strengthened (30 ETP, 38 NSIP Pilot), with many still active today. NSIP Pilot teams mostly leveraged existing partnerships, while at least 16 new partnerships were developed for ETP.
- **UK supply chain –** 70% of ETP supply chains are UK based, but we lack evidence to assess NSIP Pilot supply chains.
- **Reputation gains for UK organisations –** the vast majority of respondents felt UK Space Agency support had improved their reputation in relevant sub-sectors (100% NSIP Pilot, 85% ETP), with some ETP projects saying it is too early to say.
- **Strengthened competitive offering –** most project teams feel NSIP funding has strengthened their competitive offering (5/6 NSIP Pilot, 30/36 ETP), but highlighted they are at low technological maturity, meaning further funding/investment and commercialisation is necessary.
- **Evidence of early UK leadership –** both calls have contributed to early UK leadership in niches, although caveats apply. The NSIP Pilot has also led to soft power benefits in the form of 7 international follow-on mission opportunities. Availability of follow-on UK grant funding has been listed as a potential barrier to realising these in the future.

2.3.1 NSIP Pilot projects

Partnerships and collaborations

The vast majority of Pilot projects were delivered by consortia of organisations. **Of the 22 original Pilot 2020 projects, just 1 did not involve any partners**.

We heard how these partnerships enabled organisations with complimentary capabilities to be brought together, potentially enabling **mutual learning and knowledge sharing**. Academic-industry partnerships were particularly valuable in transferring cutting-edge research developed in universities to commercial entities, where technologies could be developed for customers. The partnership between Northumbria University and ISOCOM provides a good example of this. Through the Pilot, Northumbria's Optical Communications Research Group, experts in optical wireless including free space laser communications (LCom), were brought together with ISOCOM, who specialise in designing, manufacturing and testing optoelectronic products for a space environment. See Section 3.2 for the full case study and Section 2.5.1 for a more detailed discussion of upskilling impact.

> *[Pilot funding] bridges the academic-industry divide.*

We heard how follow-on phases of Pilot funding provided an opportunity both to **further existing relationships and bring new partners on board**. In the Implementation phase, 53 organisations were involved across 11 projects. In the International phase, 23 organisations were involved across 7 projects.

The Pilot International call specifically targeted partnerships between UK organisations and **partners in key strategic nations**[27]. The call included both organisations funded through the 2020 Pilot call and new direct awards. UK organisations partnered with both foreign space agencies and industrial partners, as well as one project involving the UN. In one example, the International call enabled a partnership between UK-based Inmarsat and Japan's Mitsubishi Heavy Industries (MHI), Safran Data Systems (France) and Haigh-Farr Inc. (USA) to develop InRange, a satellite-based launch telemetry system. The partnership was a success, with Inmarsat and MHI going on to successfully bid for a £1.7m International Bilateral Fund (IBF) project, where they will demonstrate this capability using a Japanese H3 launch vehicle[28].

These international projects (we heard) brought new challenges, particularly with regards to timelines being out of the control of UK organisations. For one project, which would have enabled a partnership with NASA, these challenges could not be overcome and the project had to be cancelled due to condensed timelines. Another university-led team faced significant difficulties in their collaboration on a NASA mission after delays to the overall mission. In this case, the team were granted a cost extension and project work is still going ahead at the time of writing. The collaboration has enabled the UK to play a key role on a light touch NASA mission, delivering one of two payloads.

The **partnerships supported through NSIP generally built on existing partnerships** between organisations, though with some exceptions. We have evidence of **at least six new partnerships enabled by the NSIP Pilot**, one between a company and research institute, one between a company and a university, and one between a university and an international government body. This is expected to be an underestimate since in many cases we could not acquire this information given the time which has passed since projects started. In a couple of examples, there had been an existing personal relationship, but Pilot funding allowed these relationships to develop into a formalised relationship between the two organisations, unlocking mutual learning benefits.

While relatively few new partnerships were created, Pilot funding played a more widespread role in strengthening existing partnerships. We found evidence of **at least 38 partnerships which project teams agreed were strengthened** through Pilot project work[29]. Pilot funding often allowed the continuation and deepening of existing relationships, where further funds were required for organisations to continue working together. Within larger organisations, Pilot funding also sometimes allowed different departments or groups to work together for the first time, facilitating knowledge sharing within organisations. For example, one project brought together for the first time computational experts and geoscientists operating within different Schools within the same university, facilitating inter-disciplinary research.

Many of the partnerships supported by Pilot funding are ongoing today, demonstrating their strength and the potential for mutual benefit. Some organisations went on to apply for other sources of funding as a partnership, while others applied to future NSIP or ETP calls. In one example, a partnership between a university and a not-for-profit is still active five years after first applying for grant funding together. The project failed to proceed to the Implementation phase,

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[27] The call targeted specific country/technology pairings e.g., Australia- Earth Observation and Canada- Robotics. UK Space Agency (2020). *National Space Innovation Programme (NSIP) - International Funding Call FAQs*. Available at: https://www.gov.uk/government/publications/call-for-proposals-national-space-innovation-programme-international/national-space-innovation-programme-nsip-international-funding-call-faqs

[28] Mitsubishi Heavy Industries, Ltd. (MHI) (2023). *UK Space Agency and Jaxa Confirm Bilateral Collaboration for Viasat and MHI to develop InRange Satellite-Based Launch Telemetry System for Japanese H3 launch vehicle*. Available at: https://www.mhi.com/news/23100504.html

[29] This is likely an underestimate, given gaps in reporting.

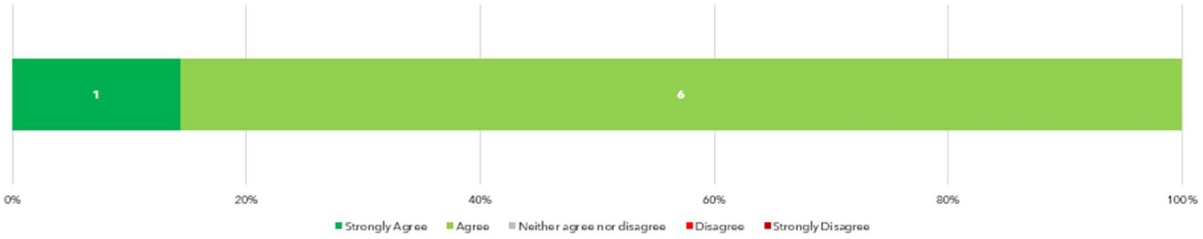
but they managed to take their project forwards through CEOI funding. The two organisations have just concluded a further ETP project together and are now looking to take part in an ESA mission together.

Beyond these partnerships, Pilot funding supported the UK space sector through broader **supply chain involvement**. 25 organisations funded through the Pilot reported that funding resulted in their organisation procuring goods or services from new UK suppliers[30]. Given the time which has passed since most projects concluded and our reliance on interview insights, we have limited data on the extent to which supply chains were UK-based overall. Still, one Glasgow-based company noted that 80% of their supply chain is based in Scotland, supporting local development.

Leadership and reputation

While our sample size is limited, project teams were **unanimously of the view that NSIP Pilot funding has improved their organisation's reputation** within their relevant sub-sector. Of those who strongly agreed there had been reputational enhancements, project teams felt that funding had helped to build international credibility, strengthening the potential for follow-on activities. These include stronger commercial interest in their technologies as well as better positioning for future mission opportunities with US partners.

Figure 15 *Stakeholders who agree NSIP Pilot funding has led to reputational gains for their organisation in relevant sub-sectors*

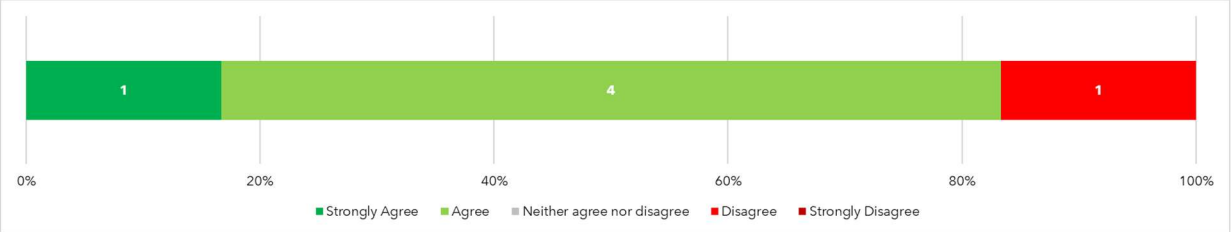


There is also some evidence of wider recognition of the work being undertaken by project teams, which has helped to raise their profile. For instance, **one project team received two awards which were in-part attributable** to their NSIP Pilot activities – including a *Scottish EDGE business award*, and an *ESA rising star award*. The latter award was given to a handful of start-ups across Europe, who demonstrate exceptional innovation and high-growth potential[31]. Another project was featured on BBC News, focusing on the innovative aspects of the technology, and its future application potential.

There is also **evidence of project teams who feel their competitive offering has strengthened** due to Pilot funding. The examples of this were varied, but project teams generally regarded Pilot funding as **critical in improving their organisation's capabilities**. Several projects stressed that funding had accelerated technology development beyond what competitor businesses are able to provide. Others noted the role of NSIP funding in scaling up technology development, enabling organisations to move from manufacturing specific components to entire payloads.

[30] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21* and UK Space Agency (2022) *Monitoring & Evaluation Report National Space Innovation Programme – Implementation Phase 2021/2022*
[31] Craft Prospect (2024). *Press Releases*. Available at: https://www.craftprospect.com/news-1

Figure 16 *Organisations who agree NSIP Pilot funding has strengthened their competitive offering in their relevant sub-sector*



Through NSIP Pilot, organisations also undertook market research, enabling organisations to better understand their strategic advantages relative to other organisations:

> *Market research under the project revealed there are no competing businesses offering comparable satellite-based products in this sector. This enables the development of a continuously competitive product in terms of performance and costs.*

Funded organisations through the NSIP Pilot have undertaken many profile-raising activities which may have strengthened the UK space sector's reputation as a whole. For instance, several projects have presented findings at international conferences, especially within Europe (e.g. the ESA Living Planet Symposium).

Moreover, there is evidence that UK organisations have strengthened international partnerships and secured follow-on roles for international space missions, although the role of NSIP funding in improving the reputation of these organisations is nuanced. NSIP Pilot international call projects stressed that **funding increased the UK space sector's soft power on the global stage**, by helping to showcase UK capabilities to international partners such as NASA, ESA and CSA. This has positioned UK organisations for roles on **at least 7 follow-on mission opportunities**.

While this is evidence of significant reputational *benefits* associated with NSIP Pilot funding, two international projects also highlighted reputational *risks* associated with the funding (and UK Space Agency grant funding more broadly). These two projects noted that **the lack of continued grant funding** (especially across spending review periods) **was a significant barrier to continued cooperation with NASA**.

Relationships between UK-based organisations and NASA strengthened through NSIP Pilot, although both sides highlighted the risk of being perceived as an inflexible or unreliable partner due to these funding constraints. Of course, **these challenges are not unique to the NSIP programme**. However, it is notable that these risks have implications for the UK's global leadership in specific instrument development, the credibility of the UK as a trusted space partner of choice, and the opportunity to secure roles on international missions at relatively low cost.

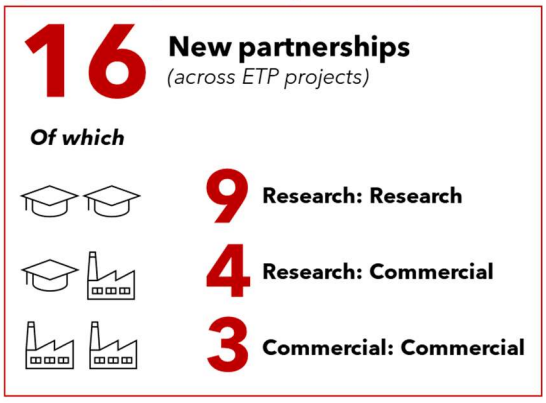
2.3.2 ETP projects

Partnerships and collaborations

Most ETP projects were delivered as part of a partnership. **Across 41 ETP projects, only 11 projects were delivered by one organisation** alone. Collaboration was key to delivering innovation through ETP. Partnerships between academic organisations were the most common,

followed by partnerships between academia and industry. This reflects the large number of academic organisations funded through ETP. No projects involved more than 3 organisations.

Figure 17 *Types of new partnerships created across ETP projects*



At least 16 partnerships were new. Project teams often noted that they had pre-existing informal relationships with contacts at partner organisations, but ETP funding allowed conversations to develop into concrete work. Within academia, researchers often work in niche fields where the community of academics is small and close-knit, so in many cases there existed a strong network of informal ties upon which to quickly build a project consortium. These networks were, we heard, especially important in building project teams given the relatively short window in which to submit an application. Several teams noted that they could only build a consortium so quickly because of these existing links, whilst other organisations delivering projects solo commented that the short window to submit an application was a barrier to creating new partnerships.

Partnerships between different universities in several cases developed through personal relationships which withstood an academic moving between universities. In one case, a former post-doc student received a lectureship at another university and put his new organisation in touch with his alma mater. The two universities partnered together on an ETP project and have since successfully applied for ESA funding as a partnership, demonstrating the ongoing strength of the collaboration.

Even where projects were delivered solo by an organisation, we heard how **ETP is sometimes encouraging future collaboration**. In one case, a university presented their ETP work at another university and were approached to work together in future. They are now looking to pursue future research grants as a partnership.

Besides creating new partnerships, ETP is also strengthening existing partnerships. Project teams reported that **at least 30 partnerships have been strengthened as a result of ETP funding**. Building stronger partnerships lays the foundation for collaboration on a greater scale in future, ensuring mutual trust between organisations. In one example, a not for profit and a commercial entity had worked together before on another grant-funded project. The partnership enabled knowledge exchange, as well as providing the commercial entity with access to crucial facilities to advance their research. The two organisations are currently looking for further grant funding opportunities to advance their research together.

ETP funding is also supporting UK supply chains, with funded organisations on average reporting that **70% of their supply chain is UK-based**. This high UK share means that most of the project cost remains in the UK, minimising leakage and maximising the potential for UK benefit. Given the nature of the innovative technologies being developed, projects often required niche materials or components. This means that for some teams, developing a supply chain has been a significant element of project work and ordering components or materials requires establishing a relationship

with suppliers. Where project teams used non-UK suppliers, several noted that they only sourced components or materials from abroad because they could not find what they needed in the UK.

Leadership and reputation

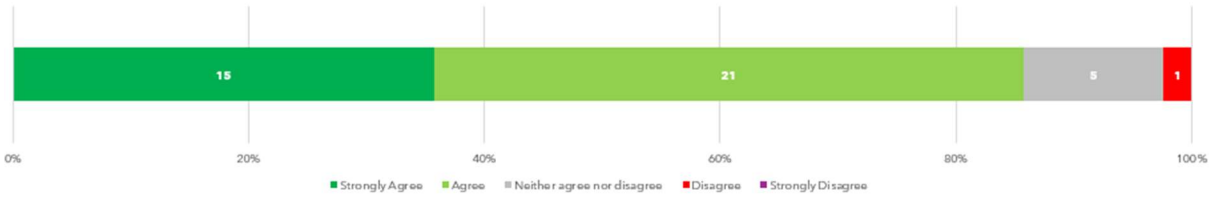
While leadership and reputation gains take time to develop, and many ETP projects are still ongoing, **over 85% of ETP funded organisations feel that securing funding has already improved their reputation** within relevant sub-sectors. Several project teams felt that invitations to attend international conferences and workshops provided evidence of their growing reputation. Indeed, one project team presented their ETP research at the SPIE 2024 conference in Japan, and received an award for the 'best oral presentation'[32].

Others mentioned the crucial role of de-risking in raising the appeal and credibility of early-maturity technologies to potential customers and investors, as well as the wider academic research community. Some stakeholders also mentioned that receiving ETP funding had increased awareness of their organisation's ongoing work in this area.

As with the NSIP Pilot projects, there is also evidence of wider recognition and publicity associated with ETP project activities which are likely to contribute positively to the reputation of funded organisations. Across ETP projects, there are at least **16 promotional online articles and social media posts describing ETP activities**.

For 6 organisations, it was deemed premature to talk about reputational improvements associated with ETP funding, as research publications, publicity, and promotional activities will follow project milestones which come later in the project.

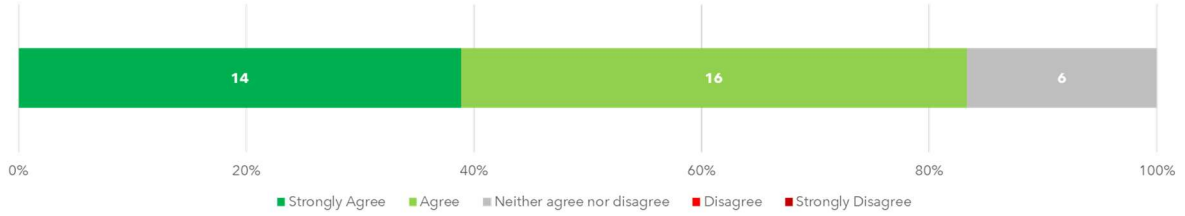
Figure 18 *Stakeholders who agree ETP funding has led to reputational gains for their organisation in relevant sub sectors*



Despite technologies being at a **very early stage of technological maturity**, ETP project teams held positive views on the role of funding in strengthening their competitive offering, with over 85% of project team respondents agreeing. To provide examples, stakeholders highlighted the novelty of the technologies being developed, highlighting capabilities which they viewed cannot be found elsewhere in the European or global supply chain.

[32] Durham University (2024). *CfAI Head of Optican Design gives award winning talk at the SPIE conference in Japan*. Available at: https://www.durham.ac.uk/departments/academic/physics/news/award-winning-presentation-at-spie-conference-in-japan/

Figure 19 *Organisations who agree ETP funding has strengthened their competitive offering in their relevant sub-sector*

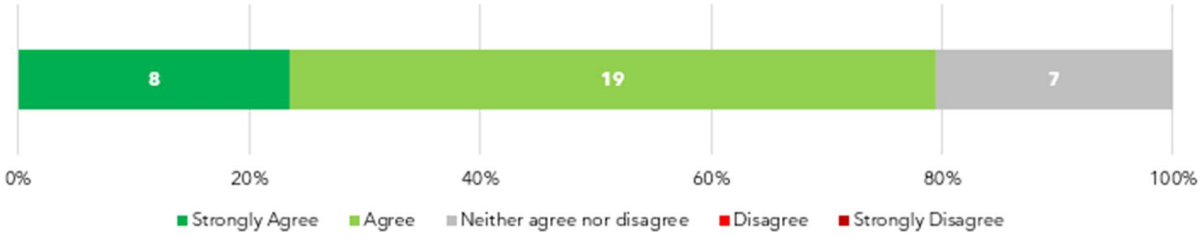


Understandably, many project teams noted that further funding, TRL raising, and commercialisation activities would be essential to realise more sizeable impacts for their organisation and wider UK supply chain. However, other projects have highlighted the role of ETP funding in catalysing **follow-on funding opportunities**, which will enable further TRL progression to strengthen their product or service offering.

> *ETP funding has positioned us for future project work with ESA to develop the concept further, which we might not have gained at this stage without UK Space Agency support.*

We also asked ETP lead and partner organisations whether ETP funding had led to improvements in the global reputation and leadership of the UK space industry within their relevant sub-sector. For some ETP projects, it is too early to talk about the wider reputational benefits related to ETP projects. However**, the majority of project teams feel ETP has secured early leadership for the UK, in a range of niche or nascent sectors and applications**.

Figure 20 *Organisations who report UK industry reputation and leadership gains within relevant sub sectors attributable to ETP funding*



Responses from funded organisations are likely to feature a **degree of optimism bias** over their broader reputational impacts on the UK space sector. Nonetheless, project teams provided several examples of areas the UK has strengthened through ETP support.

> *The UK is well known in the space sector for its strong supply chain in detector technology. It is also starting to take a leadership on optics, and this project has helped to enable this. The collaboration has also led to the world's first additive manufacturing mirror with integrated cooling features.*

2.3.3 Counterfactual

In a scenario without NSIP Pilot or ETP funding, organisations are unlikely to have established or strengthened partnerships and collaborations in the same way. For example, we heard that international partnerships forged during the NSIP Pilot international call generally would not have occurred, given there were limited alternative funding options to pursue project-based work with international partners at the time. Following this, some organisations were able to strengthen partnerships through subsequent programmes, such as the UK Space Agency International Bilateral Fund, although NSIP Pilot should be recognised as a crucial catalyst for these follow-on activities.

There is high additionality associated with the partnerships which **were developed specifically for NSIP Pilot and ETP programmes**. This is due to UK Space Agency support helping to establish working arrangements which would not have occurred otherwise. This is more relevant for ETP projects, where 13 of the 16 new partnerships identified were established, across a range of organisation types. For partnerships which were pre-existing, additionality is more complex. Consortia may have sought to continue activities under a narrower scope, or may have continued at a slower pace. However, it is difficult to see how partnerships would have strengthened in absence of NSIP Pilot and ETP funding, considering these partnerships would risk losing momentum in absence of project-based work with clear milestones.

The majority of reputation-building activities referenced by project teams are **inherently linked to project-based activities across NSIP Pilot and ETP, suggesting strong additionality** in terms of the reputational gains that UK organisations have made. However, reputation is dynamic and organisation-specific. The reputation of organisations can be **influenced by wider factors**, such as previous delivery heritage, media coverage, public perception, and previous track records with clients. Nonetheless, there is clear evidence that NSIP Pilot and ETP have enhanced the reputation of UK organisations in the eyes of potential customers and collaborators, by helping to de-risk and mature technologies.

2.3.4 Emerging themes

Across both NSIP Pilot and ETP, there is strong evidence of collaboration within project teams and beyond. For example, only 1 NSIP Pilot project of the original 22 (2020 call) projects did not include partners or subcontractors in the project team.

Through different calls, NSIP Pilot projects were afforded the **opportunity to bring new partners on board**, while ETP also catalysed **at least 16 new partnerships**. These partnerships supported mutual learning and knowledge exchange between organisations, which helped to solidify and strengthen partnerships. Across both calls, **stakeholders reported that at least 68 partnerships had been strengthened through project-based activities** (38 in NSIP Pilot, and 30 in ETP). Interestingly, there is evidence of Pilot teams going on to partner again for ETP projects, highlighting direct evidence of some partnerships being sustained through UK Space Agency support.

Project teams also reported reputational enhancements for their organisation in their respective sub-sectors due to UK Space Agency support. NSIP Pilot teams unanimously agreed (albeit from a small sample size of 7) that their reputation had improved. 36 out of 42 survey respondents from ETP funded organisations also agreed that **UK Space Agency support had improved their organisation's reputation**, although some respondents felt it was **premature to discuss reputational improvements**, as projects are still ongoing. While NSIP Pilot projects have generally had more time for reputational benefits to accrue for funded organisations, coverage from ETP project teams also paints a positive initial trajectory.

Project teams shared similar sentiment around their competitive service offering. 5 in 6 NSIP Pilot projects felt their offering had strengthened as a result of technological development through the project, a sentiment shared by 83% of ETP leads and partners. Across both calls, **stakeholders were generally optimistic that early leadership had been secured** in sub-sectors of the global space industry, but as we are still dealing with fairly low technological maturity at this stage, **further funding, development, and commercialisation would be necessary to realise any first-to-market advantages**.

These early technological advantages were seen as linked to positive improvements in the UK's reputation for many ETP projects, although the same early-stage caveats apply. We have a slightly different picture for NSIP Pilot, where funding has led to **potential soft-power benefits** for the UK through follow-on mission opportunities, but also potential risks associated with the availability of reliable and flexible grant funding across spending review periods.

2.4 Capturing market share

The objective of our evaluation in this impact area is to assess the extent to which NSIP is helping organisations capture a greater share of target sector markets and accelerate the market entry of new products and services.

Summary of key findings

- **Route to market** – NSIP Pilot and ETP projects have had limited impacts in terms of technologies having been commercialised so far - only 2, by Pilot projects. However, 35 new technologies, products or systems are expected to be commercialised in the future, with 83% of these having been reported by ETP project teams (in part likely reflecting that we were able to speak to more ETP than Pilot project teams).

- **New clients and customers** – both funding streams led to some impact in terms of customer base expansion, with teams reporting 11 new clients and customers, as well as 31 expected in the future.

- **Market access** – both funding streams have generated significant market access impacts, with 12 new market segments and international markets already accessed, and 37 more expected in the future. The anticipated future access is largely driven by ETP projects, which expect to enter 31 of these markets, although this may reflect the higher number of ETP teams interviewed.

- **Expected income impacts** – our analysis captured some early revenue impacts, with £130k reported across three ETP projects and one NSIP Pilot project reporting £1.1m in attributable income. In terms of 6-year projections from project start, ETP projects provided self-reported estimates of up to £67m in expected income across 20 projects. Meanwhile, two NSIP Pilot Implementation projects projected potential revenues of £4.6m and £190m, respectively. Evidence of these optimistic forecasts being realised is, as yet, therefore limited.

- **Spin-ins and spin-outs** – NSIP Pilot encouraged the creation of two spin-out companies. While one has been dissolved in 2023, the other developed to become an NSIP Major Project funding recipient. In addition, we found some limited evidence of companies, institutions, and project teams entering the space sector through ETP funding, and space companies finding new non-space applications for their products and services.

2.4.1 NSIP Pilot projects

Commercialisation

Since receiving NSIP Pilot funding, we observe that all lead organisations are still in operation. However, three partners across three projects – two under Implementation funding and one under International funding – have since been dissolved. While funding has contributed to TRL advancement, **few products have yet reached the market**. No NSIP Pilot projects reported their innovation as being market-ready at the time of project completion. The majority of projects intended to continue developing their innovation, with further development expected to be funded primarily through grant funding or third-party investment. A small number of projects, however, planned to fund their developments internally.

Figure 21 *Products brought to or expected to be brought to market across NSIP Pilot projects*

The updated evidence we collected from consultations indicates that Pilot funding has so far directly contributed to **bringing two products to market**, with **six more expected in the near future**. However, challenges remain in accurately assessing the overall reduction in time to market due to limited data and various influencing factors. One project, down-selected for Implementation funding, credited NSIP for helping them develop a concept for a new software product, while another expects to launch three products over the next few years: a laser driver board in 2025, a laser communications terminal in 2027, and a laser detection system in 2026.

When examining the expansion in customer base following NSIP Pilot funding, our analysis shows limited details related to new clients, a result that is coherent with the small number of products brought to market. However, some NSIP Pilot recipients reported optimistic results in terms of future expectations, with 15 potential customers identified.

Figure 22 *New or expected clients and customers across all NSIP Pilot projects*

For instance, one project down-selected for Implementation funding reported gaining at least three new clients, including securing a partnership with a Japanese entity, which opened doors to further conversations with private and institutional actors (such as the UK-Australia space bridge). Another down-selected project signed reseller agreements with around ten companies, strengthening its role as a data supplier. Additionally, a non-down-selected project reported expanding into three new geographical markets focused on natural disaster alert technology and engaging with new partners, including a defence actor and a major charitable donor.

Data on income generated by Pilot-supported products remains limited, with only one project reporting revenues totalling £1.15m, split between £600k in 2022 and approximately £500-600k in 2024, all of which was reinvested.

Market access and spillovers

Project teams reported limited new market access opportunities. Feedback from three projects indicated that **2 new market segments have been accessed**, with **2 more expected in the future**. There are, however, few notable examples highlighting how receiving funding helped the projects expand their market access ambitions (in part likely reflecting reliance on partial information).

For instance, one project representative – whose project was down-selected for Implementation funding – mentioned that NSIP enabled them to develop a concept then applied to a new software product, ultimately allowing access to new markets. In addition, three different projects mentioned either entering or strengthening their position in weather-related markets. One of these aims to

support clean satellite imagery through advanced data processing, while one International Pilot project is currently developing a thermal mapper for adaptation to EO uses.

From a geographical perspective, two Implementation projects and two International Pilot projects collectively **accessed 4 new international markets**, while one project anticipates future access to **4 additional markets**. The two International projects specifically mentioned entering the US market. Notably, one of these projects facilitated UK involvement in a NASA mission through the delivery of a magnetometer instrument.

> *"We were approached from US to build something they couldn't build. (…) There was no official UK involvement in this NASA mission, at all. Now the UK community is going to get involved.*

The expansion of opportunities in diverse markets increases the potential for technological spillovers encouraged by NSIP Pilot funding, especially in sectors such as defence, as explained in Section 2.2.1.

Revenue

We found limited evidence of realised revenues linked to NSIP Pilot funding, with only one project reporting £1.5m in realised income. Additionally, unlike other NSIP calls, most NSIP Pilot projects did not provide six-year income projections in their North Star Metric reporting, as they predated the Metric's introduction within the UK Space Agency. However, two NSIP Implementation projects did share estimates: one reported £4.6m in expected new contract revenue, while another project team forecasted £190m in income over the next six years.

Technology transfers

A review of internal UK Space Agency Pilot M&E and proposal documents revealed evidence of two spin-out companies being established as a result of NSIP Pilot funding[33]. One spin-out emerged after the technology developed under NSIP identified new business opportunities, leading to the creation of a company focused on transforming weather forecasting and supporting climate change objectives. However, a search of Companies House records showed that this spin-out was dissolved in March 2023.

Additionally, one significant spin-off impact was highlighted in a proposal for NSIP Major Projects funding. An academic institution that had previously received NSIP Pathfinder and Implementation grants reported the establishment of a company, attributable to the expertise and employment impacts obtained through NSIP Pilot funding. This spin-out subsequently applied for and secured NSIP Major Project funding.

2.4.2 ETP projects

Commercialisation

As mentioned above, the relatively low maturity of technologies developed through ETP means that most projects have not translated into disruptive commercial solutions yet. For the same

[33] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21* and UK Space Agency (2022) *Monitoring & Evaluation Report National Space Innovation Programme – Implementation Phase 2021/2022*

reason, measuring the actual reduction in time to market favoured by ETP funding remains challenging. Most projects are currently focusing on additional testing and in-orbit demonstrations, which means they are often still some years away from full market readiness and commercial use.

Figure 23 *Expected new products to be commercialised across all ETP projects*

However, despite not being at the stage of commercialisation, most ETP projects have a plan to achieve this. Among all the ETP teams covered, **27 interviewees reported at least one product expected to be commercialised**, for a total of 29 technologies, products or systems awaiting marketisation. Several projects reported being between two and three years from commercialising their products, considering time for further testing and TRL-raising activities, as well as generally one year for qualification. Products include novel technologies (e.g. LIDAR-related advancements, thrusters and propulsion technologies), techniques and testing methodologies (e.g. Sterilisation technique), as well as software (e.g. modelling software for advanced joining).

When considering impacts on their customer base, most projects have not yet reported acquiring new clients, often because they are still in early development stages and a few years away from establishing formal customer relationships. Some companies have expressed interest in project outcomes, but no formal clients have yet been secured. However, four projects did report a total of six new clients. For example, one project attracted interest from an Australian entity looking to use their new chamber for testing and optimisation, while another received inquiries from a defence company and other commercial partners. Additionally, five projects expect to gain a further ten clients in the future, including potential partnerships with defence clients, international agencies, and organisations like the US National Weather Service, NASA, and ESA.

Figure 24 *New or expected clients and customers across all ETP projects*

Market access and spillovers

ETP funding has encouraged several companies to enter relevant market subsectors and expand their market presence, resulting in reported growth in market access. Three projects have accessed four new market segments, with at least 25 more expected across 10 projects. Geographically, only two projects have accessed one new market each – Canada and Germany – while 6 more international markets are anticipated. In total, this results in **29 new market segments and 8 new geographical markets accessed or expected in the future**.

The identified market segments span both new technological sub-markets within the space sector and adjacent industries such as aerospace, automotive, and medical. Notably, ETP funding has facilitated access to non-space markets for funded organisations, enabling them to explore a wider range of potential opportunities. For example, one project outlined plans to seek Medical Research Council (MRC) grant funding to explore medical applications, specifically using ECGs for heart rate monitoring. Additionally, another project reported plans to enter nine markets, with significant interest from sectors such as pharmaceuticals, motorsport, nuclear, and

semiconductors. This highlights how ETP has helped funding recipients expand their market reach beyond the space sector.

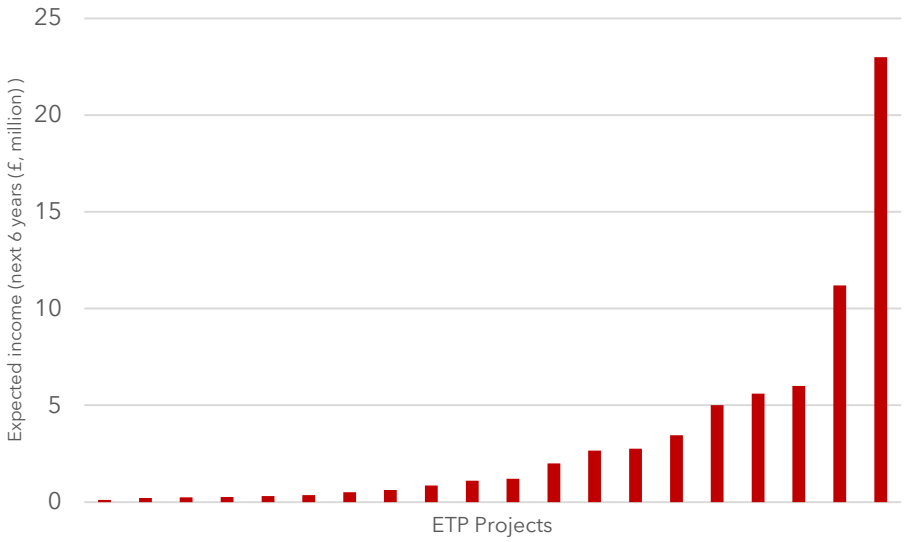
In addition to expanding market access, ETP funding has shown **potential for spillovers** into several sectors, with defence and security being a prominent example.

Revenue

At this stage of analysis, we can only report limited data on revenue impacts for ETP projects, as their commercialisation potential is largely yet to be realised. 29 projects reported that no revenue impact with attributable link to ETP funding has been realised yet. However, three projects did report new revenue, with **a total of £130k having been realised across Q1, Q2 and Q3 2024/2025**.

However, 20 projects self-reported estimates of expected income over the next six years in their North Star Metric reporting. This income, attributed to NSIP investment, is tied to new goods, services, or other products. Together, these **projects forecasted a total impact of approximately £67m**, with individual projections ranging from £0.1m to £23m.

Figure 25 *Expected new contract revenue (self-reported, ETP projects)*



Technology transfers

Our research found limited evidence of institutions, companies, and project teams entering the space sector as a result of ETP funding. For example, one academic institution reported that, although their university has long-standing expertise in space, this was the first space-related project for the specific research team involved. In another instance, an academic institution entered space-related research entirely because of its partnership on an ETP project. From an industry perspective, we also found that one company entered the space sector through ETP funding, specifically in the area of space instrumentation.

Additionally, the high proportion of academic-led projects under ETP funding (we heard) creates **strong potential for spin-out companies**. Many projects come from institutions with established legacies in spin-out creation and significant experience bridging academia and industry. Although some institutions have not yet initiated discussions around spin-offs, they indicated they would consider this option in the future, leveraging their established expertise or existing spin-outs.

For example, one academic institution expressed interest in creating a spin-out focused on in-space manufacturing but is awaiting specific test results before formally pursuing this path. Another institution reported being approached about a potential spin-off but noted that the current low TRL limits their ability to attract VC funding, delaying spin-off development.

2.4.3 Counterfactual

Again, NSIP Pilot projects indicated that several key technological developments simply would not have occurred without NSIP funding. This funding accelerated the path to commercialisation, helping these projects to reach market readiness at a significantly faster pace. Without it, progress would have slowed considerably, potentially jeopardising the UK's advantage in strategically important areas. ETP project teams echoed this, noting that without funding, their advancements would have been delayed and would likely have diminished the UK's competitiveness in rapidly evolving sectors. Similarly, those who were unsuccessful in their funding bids generally stated that either (i) their project had not been progressed, or (ii) it has been taken forward, but overseas.

The **importance of continued funding support** was a common theme. Given the TRL focus of the Pilot and ETP, the **vast majority of projects require additional resources to reach commercialisation**, and delays in new funding opportunities could risk interrupting progress. A gap in funding could also lead to slower development, creating a window for international competitors to gain traction in areas where the UK has been building expertise. We heard how prompt and consistent funding is critical to maintaining momentum, ensuring continuity, and securing the UK's position in these strategic sectors.

> *"ETP did shorten our way to market. But we need to be quick, because other competitors have now heard of our technology, and it's only a matter of time before someone else jumps on this. This is why we are not sharing our results yet. (…) Now we are looking at ESA funding, because the UK Space Agency hasn't published any call.*

2.4.4 Emerging themes

Our analysis of the NSIP Pilot and ETP projects reveals several key themes related to commercialisation, market access, and innovation spillovers. While each programme differs in terms of project maturity and market readiness, both demonstrate promising developments and potential impacts across targeted sectors. The story, however, is largely one of **potential impact rather than significant already-realised impacts**. This is not unexpected given the nature and TRL focus of the programmes.

From a commercialisation standpoint, NSIP Pilot projects have shown early impact, with a few products and services already reaching market and others expected within the coming years. Similarly, ETP projects are generally in earlier stages of development (unsurprisingly, given that they started later) and are not yet market-ready . However, several projects report having receiving client interest and are exploring potential future collaborations, though at the same time were keen to highlight potential funding drop-off issues, linked to well-understood 'valley of death' effects.

In terms of market access, projects across both funding streams have reported significant impacts. Collectively, funded organisations have accessed 12 new market segments and international markets, and expect to access 37 more, for a total of **49 new markets**. This result is primarily driven by ETP projects, which anticipate accessing 31 new markets, including both new segments and geographical areas.

Both NSIP and ETP projects highlight significant potential for technological spillovers, particularly in defence and dual-use applications. While many projects feature dual-use capabilities, the actual suitability of these technologies for defence varies depending on each technology's specific applications.

Regarding revenue potential, as anticipated, limited concrete revenue data is available, as the projects have in general not reached commercialisation. Three ETP projects reported a total of £130k, while one NSIP Pilot project reported £1.1m in attributable income. In addition, we drew on North Star Metric reporting data provided at application stage (for ETP projects only) to assess expected income from new contracts attributable to NSIP over six years from project start. Among 20 ETP projects, self-reported estimates varied in scale, totalling up to £67m. For NSIP Pilot projects, data was only available for two Implementation projects, which project potential revenues of £4.6m and £190m, respectively. To date**, we see little hard evidence of realisation of these optimistic revenue forecasts**, though again note that we are at relatively early stages in the longer term benefits realisation pathway.

Lastly, we found that NSIP Pilot funding encouraged the establishment of two spin-off companies. Even though one has been dissolved in 2023, the other has since grown and obtained funding under the NSIP Major Projects stream. In addition, ETP projects, particularly those led by academic institutions, display strong potential for future spin-outs (though again the story is one of potential rather than already-realised impacts). Many institutions involved in ETP have a legacy of spin-out creation, laying a solid foundation for new initiatives. Some are actively considering spin-outs in areas such as in-space manufacturing, although the low TRL of developed technologies may delay these efforts.

2.5 Skills and employment

Across NSIP Pilot and ETP projects there is evidence of **highly skilled roles** being supported by funding. Pilot and ETP funding has also led to **job creation** in the sector, despite **challenges project teams faced in hiring**, notably due to the short-term nature of the funding calls. Employee profiles supported by the funding include engineers - often **highly specialised experts** in their fields – as well as leading academics and project management professionals. While difficult to quantify precisely, there have been significant examples of **upskilling**, with teams learning new technical capabilities and increasing their knowledge base within their fields. This effect is particularly pronounced for **early career workers**, with Pilot and ETP funding supporting numerous recent graduates and PhD students, as well as involving interns.

However, **the longer-term skills and employment impacts of the programme are likely to be driven by the success (or otherwise) of Pilot/ETP-derived new products and services**, and how they are commercialised and deployed. For the time being, we are largely measuring employment impacts that are a direct result of project funding, i.e. the roles that are being supported by this funding rather than the longer-term roles that can be created as new products and services are developed, invested in, and sold. Therefore, the impact that NSIP has had on skills, knowledge, and capabilities within the UK space sector is currently largely limited to project teams, but in the longer-term may have a sectoral-level impact.

Summary of key findings

- **Employment** – ETP and NSIP Pilot cumulatively supported 25 job years of employment, creating 63 UK FTEs through NSIP Pilot and 19 through ETP. As many ETP projects have only recently started, greater job impacts are anticipated in the future, with 383 new FTE roles projected over the next six years.

- **Expertise** – Pilot teams are dominated by engineers working in industry, whilst ETP teams are more academic. This reflects the make-up of funded organisations.

- **Early career and student involvement** – the two funding streams have supported at least 60 early-career workers, along with 2 students through the NSIP Pilot and 24 students plus one apprentice through ETP.

- **Upskilling** – we have strong examples of technical upskilling through the Pilot but data is too patchy to draw strong conclusions. ETP is leading to technical skills development in specialised fields, especially for early career workers, with the vast majority of firms reporting improved skills as a result of funding (95%, or 35 of 37 survey respondents).

2.5.1 NSIP Pilot projects

With Pilot projects starting in 2020 and most having concluded, nearly all employment impacts stemming directly from project work have played out. However, Pilot projects continue to have an impact on the current activities of funded organisations. Often Pilot funding has been just one element in a larger project or the development of a piece of technology or mission. As such, **the employment and upskilling story is still ongoing, and represents only an interim view of eventual impact**. Also, given the time which has passed since many projects concluded, some project leads have moved on, and others struggled to recall skills and knowledge impacts. What follows therefore represents a partial view of impact, in places leaning on project-level examples.

Employment impacts

Employment impacts are an important indicator of the overall amount of economic activity catalysed by NSIP. We consider both jobs created, and supported by the programme in Full-Time Equivalent (FTE) terms. Job creation refers to new jobs created *as a result of the NSIP*.

Across NSIP Pilot projects, a total of **nearly 14 years (over 25,000 days) of employment were directly supported by project work**. Of this, nearly 8 job years were supported by the 2020 Pilot Call, 3 by the Implementation call and 4 by the international call[34]. There is significance variance in the amount of employment supported by each project, regardless of whether projects went on to receive further phases of funding.

Figure 26 *Jobs supported directly by the NSIP Pilot*

Though there is clear evidence of employment supported by the Pilot calls, there is less tangible information on the precise extent of NSIP Pilot-catalysed job creation, though there is strong evidence of some job creation impacts. Shortly after the Pilot 2020 projects concluded, **44% of project teams surveyed (10) confirmed they were able to take on more UK staff** as a result of the grant funding and 88% said that they intended to hire more UK staff in the future as a result of funding[35]. At the time of the conclusion of Implementation projects, the majority of these organisations have not hired more staff, perhaps demonstrating significant optimism bias.

[34] Note: there are some data gaps for the International and Implementation calls, so this should be considered a lower bound on employment supported.
[35] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21*.

Following the conclusion of Implementation projects, 47% of teams confirmed they employed new staff, most of which were in permanent positions. A further 3/5 project teams funded through the International call[36] and 82% of Implementation teams[37] intended to employ more staff in future as a result of funding. However, we should treat these expectations with caution given **potential for optimism bias**.

The precise extent of this job creation and the extent to which positive expectations were realised is difficult to determine. We have **examples of large employment creation impacts**, but the **data is very patchy.** This is because for the majority of projects, we could not obtain job creation data, with relevant staff having changed roles since projects concluded or struggling to recall when and why people were hired[38]. When Pilot 2020 project teams were surveyed shortly after project completion, 10 organisations reported hiring 31 new staff, of which 11 roles were permanent[39]. International call teams reported just 1 temporary position, whilst Implementation teams reported 23 new roles, of which 16 were permanent. In total, Pilot funding had led to 48 new roles. At the time of writing, we have evidence of at least 63 FTE roles created as a result of Pilot funding[40], of which 42 arose from 1 project. Our evidence is patchy on the nature of these roles, but we believe most roles are permanent. **One project team explained that Pilot funding had allowed them to double the size of the company from 6 to 12**.

Figure 27 *Job creation as a result of NSIP Pilot funding*[41]

In terms of the regional distribution the jobs created by NSIP Pilot funding, **69% of the jobs created were in the South East, 20% were created in Scotland , and 11% in the North East**. The concentration of jobs in the South East is due to large increases in headcount at one organisation.

Our econometric (quasi-experimental) approach provides another lens through which job creation can be estimated, using a top-down approach. At a high-level, we use econometric methodologies to compare employment outcomes in Pilot funded organisations with a similar control group of organisations who did not receive funding. Using this approach, we find that **on average, Pilot funding led to 3 to 4 new jobs being created in commercial organisations with less than 15 employees**. Whilst we could not find a robust result for other organisation types, this should not be taken as evidence that larger and non-commercial organisations did not create new jobs.

NSIP Pilot funding largely supported those in engineering roles, though there is significant diversity in the types of engineers supported, from electrical engineers, to mechanical and systems engineers. Some project teams included staff with niche expertise, for example, cryptography

[36] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21*.
[37] UK Space Agency (2022) *Monitoring & Evaluation Report National Space Innovation Programme – Implementation Phase 2021/2022*
[38] The NSIP Pilot projects took place before North Star Metric reporting, which mandates quarterly reporting of job creation impacts and provides a rich source of data on job creation for other NSIP pathways.
[39] UK Space Agency (2021). *Monitoring & Evaluation Report National Space Innovation Programme Pilot Year 20/21*.
[40] Without further information, we cannot comment on the extent to which the new roles reported immediately after projects completed match those reported in our own data collection activities.
[41] This is the total number of new jobs catalysed by Pilot funding. It includes both roles created for individuals to work directly on Pilot projects and positions created through follow-on work. For example, if a company went on to generate external investment to fund further phases of technology development, contingent on NSIP work, and employed more individuals.

expertise, as well as world-leading experts in their fields. University teams included academics at all levels (professors, research fellows, lecturers, post docs and PhD students).

Figure 28 *Types of employment supported by the NSIP Pilot*

On average, those employed on Pilot projects had day rates of £400, though there is large variation around this number, ranging from under £100/day to well over £1,000. Most project team members had day rates of under £500. This salary data reflects our understanding that most project teams were composed of a small number of highly experienced staff, with significant involvement of more junior, early career workers (see below).

Figure 29 *Day rates of employees supported by the NSIP Pilot*

Upskilling

> *The sort of skills needed in this area are extremely rare. UK Space Agency funding has allowed us to bring on younger staff, enabling those near retirement to pass on important knowledge.*

Pilot funding enabled the upskilling of at least 25 early career workers and a further 5 students. Universities noted strong involvement of PhD and post doc students, with many going on to pursue work in the sector, often directly leveraging skillsets gained through their projects. For example, one PhD student was involved in a Pilot project through his university, and then secured a position at their commercial partner organisation working in EO calibration. On another project, three post-docs were on the team and two went on to work in private industry, directly using skills learned during their time on the Pilot project. Commercial organisations involved recent graduate

profiles, including 3 PhD students, 10 post-docs and those on internships in their projects, with one project alone estimating 12 recent graduates had been hired because of their Pilot funding.

We did not find evidence of any apprentices involved with Pilot projects.

Figure 30 *Early career workers supported by the NSIP Pilot*

Due to the time which has passed since funding was first received, many teams struggled to provide measurable insight on the extent to which Pilot funding enabled skills development within their organisation. Nevertheless, we have strong examples of technical skills development. One project lead explained how Pilot funding enabled them to collaborate with specialists in cybersecurity, which was complimentary to their own team's skillsets, enabling mutual learning. Another project lead noted that a postdoc working on their Pilot project has gone on to work for their commercial partners. Conversely, a couple of project leads noted that the gaps between different phases of Pilot funding made it challenging to upskill their teams consistently, with down periods of several months between funding phases. This was a **particular issue within universities, where staff are often hired to work on a specific project, so could not be kept on without further funding. This created skills retention issues** where follow-on funding was not secured, and potentially limits the ultimate job creation impacts.

We found limited evidence of impact regarding the extent to which Pilot funding led to the use of new project management tools or processes. This likely reflects both the time which has passed since Pilot projects, with interviewees having difficulty in recalling details, as well as the fact that many teams were experienced in delivering similar projects, hence there was limited need to change these management processes. Still, one university team did report hiring a dedicated project manager as a result of Pilot funding.

2.5.2 ETP projects

Most ETP projects are ongoing at the time of writing, with the remainder having recently concluded. Therefore, the impact story is still unfolding, with project teams expecting to hire new staff in future, as well as upskill their current teams. The long-term employment and upskilling impacts are still unknown – and as discussed above will ultimately be driven by the success or otherwise of ETP-derived products and services - so what follows again represents a partial picture.

Employment impacts

Across ETP projects, nearly **11 years (approximately 20,000 days) of employment are expected to be directly supported over the lifetime of projects**[42]. On average, each project will support just over 3 months of employment, although there was significant variation around this number, largely reflecting differences in project budget.

[42] These estimates derive from finance sheets at application stage and refer to hours directly spent on project work.

Figure 31 *Jobs supported directly by ETP*

So far, we have identified a total of **19 new FTE positions** that have been created due to ETP funding, of which 12 are in lead organisations and 7 in partner organisations. These are new hires which project teams link directly to ETP funding. These new hires are a mix of temporary and permanent positions[43]. We heard how **academic-led projects struggled with hiring new talent given the short timelines associated with ETP projects and the hiring models in academia**, where staff are rarely hired for less than two years and the hiring process can take months, given bureaucratic university-level systems. Nonetheless, there are examples of job creation with one university hiring two students working on their ETP project once they had finished their PhDs. Two other universities made 3 new hires each.

Since many projects have kicked off relatively recently, and hence are ongoing at the time of writing, the impact story is still unfolding. **We should expect greater job creation in future**; at the time that they wrote project proposals, ETP project teams estimated in total that they **could create 383 new FTE roles over the next 6 years** as a result of funding. These are jobs associated with an ongoing ramping up of their technology development and its ultimate commercialisation and deployment. On average, each project team estimated that they could create 9 new FTE positions as a result of ETP funding. If we apply a standard type 2 space employment multiplier[44] to capture indirect and induced employment impacts, ETP funding could in total create over 900 new roles. Still, we should be cautious in interpreting these forecasts, given potential for optimism bias[45]. In Section 2.5, we compare expected job creation to realised job creation to date. **Early evidence (or lack thereof) suggests that these forecasts may be subject to strong optimism bias**.

Figure 32 *Job creation as a result of ETP funding*

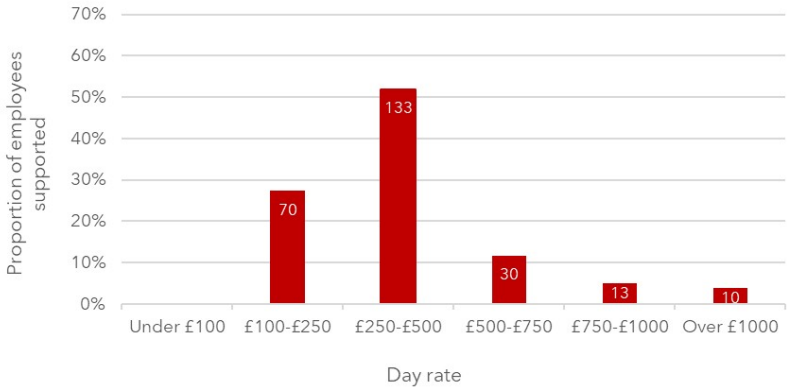
ETP funding is supporting a **variety of roles in industry and academia**. 'Co-investigator' was the most common job description for employees supported under ETP, reflecting the large number of academic organisations. Project Manager is the second most common job description, with every commercial organisation including this role. Besides these senior roles, ETP funding is supporting academics at every level, and various engineering (and other) roles in industry.

[43] Many interviewees did not know whether positions are temporary or permanent.
[44] London Economics (2024). *Size and Health of the UK Space Industry 2023*. Available at: https://www.gov.uk/government/publications/the-size-and-health-of-the-uk-space-industry-2023/size-and-health-of-the-uk-space-industry-2023
[45] In our Final Evaluation, we will compare these forecasts with realised job creation impacts.

Figure 33 *Types of employment supported by ETP*

On average, those employed on ETP projects had day rates of £430, though there is large variation around this number, from just over £100/day to well over £1000. Most project teams members had day rates of under £500, likely reflecting that teams were largely made up of more junior staff, often early workers (see below), with a smaller number of highly experienced, senior team members. These day rates are also slightly higher than those associated with the Pilot, at least in part likely a reflection of inflation over the period between funding calls.

Figure 34 *Day rates of employees supported by ETP*



The allocation of grant funding across regions and devolved administrations has broadly, although not completely, translated into employment impacts. In terms of FTEs supported in the project, the **highest concentration is in the South East (146 FTEs supported)**, followed by Scotland (63), which received the second most grant funding per region. There are some differences, however, as the 47 FTEs were supported in London, while 39 FTEs were supported in the East Midlands, despite a slightly lower relative share of grant funding.

In terms of job creation, there is a modest but dispersed spread of new roles across regions and devolved administrations linked to ETP funding. For instance, 3 FTEs were created in Scotland, followed by 2 in Wales, followed by 1.7 in the East of England.

Upskilling

ETP funding enabled the upskilling of at least 35 early career workers across 27 projects. Early career workers were especially involved in university-led projects, with many post-docs playing important roles. This is despite the difficulties inherent in attracting post-doctoral researchers to shorter term roles, with most (we heard) interested in securing longer term contracts. Project leads emphasised how valuable these early career workers were and gave clear examples of career progression enabled by funding. One academic noted that they were able to hire a student who had just finished his PhD as a research fellow to work on their project. Another academic

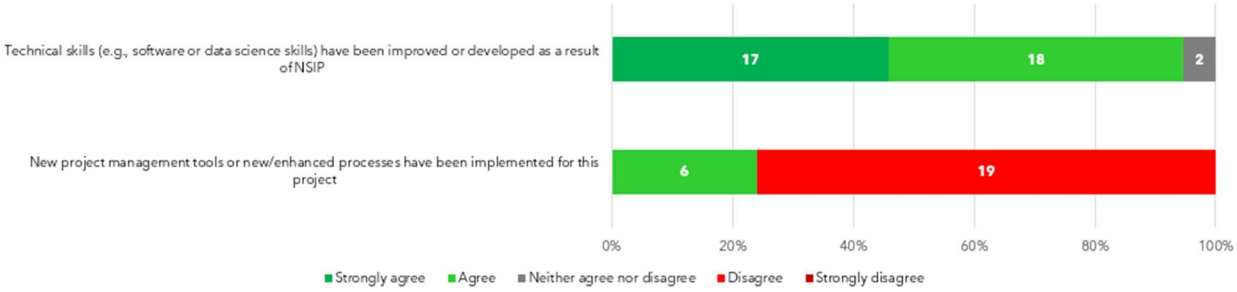
mentioned that a post-doc working on his ETP project managed to gain a full-time teaching position, which can be linked to his role on the project.

Across ETP projects, 24 students were involved, mainly within university teams (typically PhD students, occasionally Master's students), but also as interns in industry. Universities noted that students often gave their time for free, since they identified this as route to moving ahead in their research field. This gave students valuable learning opportunities whilst progressing project work.

Figure 35 *Early career workers supported by ETP*

Beyond involvement of early career workers, ETP enabled the development of technical skills across funded organisations. Of 37 respondents, 95% of funded organisations 'agreed' or 'strongly agreed' that their technical skills had improved as a result of ETP-related work. Diverse new skills reported include novel manufacturing techniques, knowledge of new software, testing and validation skills, and verification and validation techniques. Many project teams noted that the partnerships enabled by ETP enabled important knowledge sharing between consortium members (see Section 2.3.2).

Figure 36 *Skills development as a result of ETP*



We found limited evidence of new project management tools or processes implemented for ETP projects, though there are some interesting examples. One project manager explained that ETP was the first project she had managed, and she was able to learn management skills from their commercial partners. Still, for most teams ETP was similar to past projects, so there was little need to implement new processes. Also, no partner organisations reported new tools or processes, reflecting that they were not tasked with overall project management.

2.5.3 Counterfactual

In the absence of the NSIP Pilot or ETP, we should expect that **most people involved would have been working on other activities**, developing their skills in a different direction. However, there

are notable examples of **valuable skills which would not have been developed** or could have been lost in the absence of funding. These include software skills, testing and validation skills, new manufacturing technique, and so on. It is often difficult to tease out what project teams would have been doing without funding.

Our interviews suggest that **most people would have been in the same roles**, working on different projects. However, there is a tangible possibility that **jobs could have been lost** in the absence of funding, leading to a loss of talent and specialised capabilities in the sector. One company developing a potentially disruptive technology noted that they would not exist without ETP funding. On the flipside, funding has directly led to the creation of highly skilled roles; another company explained that they were able to double in team size as a result of Pilot funding. The story is complex as these skilled workers could also have found work elsewhere in the space sector, which is characterised by skills shortages[46] or outside the sector, implying there is strong demand for workers with the necessary skillsets.

It is clear that **skills have developed in different directions as a result of NSIP**. Several new organisations have entered the space sector, and many have increased their space activities as a share of company activity, gaining knowledge of the sector and ultimately increasing the pool of individuals with this knowledge base. NSIP Pilot and ETP funding has supported the development of **niche, highly prized skills**, including those identified as skills gaps in the sector, notably software and data skills[47]. Projects included many early career workers and students, with examples of these individuals going on to work in the sector, **supporting the next generation of space professionals** and helping to alleviate skills shortages. Lastly, funding enabled collaborations between organisations which likely would not have happened without NSIP, providing valuable **opportunities for knowledge sharing** (see Section 2.3).

Ultimately, whilst we cannot know what would have happened in the absence of NSIP Pilot or ETP funding, we view that **it is likely that many of these skills and employment benefits would not have arisen**.

A broader consideration on the counterfactual is related to the point around the longer-term employment impact of the Pilot and ETP being driven by the impact that new products and services developed ultimately have. If funding helps develop new products and services that secure significant investment and gain market traction in new (or existing) areas, then **job creation could be an order of magnitude larger than the relatively modest figures presented here** – where the 'actuals' reported to date largely reflect project funding being used to fund project team roles. As discussed in other sections, both Pilot and ETP have **high additionality in that they are funding activities that otherwise would not have taken place**. In considering the counterfactual, therefore, the question should not simply be one of whether those currently funded would be in similar roles, but whether the new products and services are ultimately successfully developed and deployed.

2.5.4 Emerging themes

The **NSIP Pilot and ETP have differences**, with ETP explicitly focused on low TRL projects, offering lower funding on average for a shorter duration and starting up to three years later than the Pilot. Despite this, there are **similarities in skills and employment impacts realised**. Both programmes are expected to directly support a similar number of highly skilled space sector professionals across industry and academia. Both programmes have shown significant upskilling benefits, particularly for early career workers.

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[46] Space Skills Alliance and know.space (2023). *Space Sector Skills Survey 2023 Report*. Available at: https://www.gov.uk/government/publications/space-sector-skills-survey-2023/space-sector-skills-survey-2023-report

[47] Space Skills Alliance and know.space (2023). *Space Sector Skills Survey 2023 Report*. Available at: https://www.gov.uk/government/publications/space-sector-skills-survey-2023/space-sector-skills-survey-2023-report

We have **far more comprehensive data on ETP project impacts** than the NSIP Pilot, largely reflecting the time which has passed since the call started with many projects finished, but also because of changes in reporting requirements. This, combined with differences in timelines, **limits the extent to which we can usefully compare impacts across programmes**. Still, it is worth noting that as Pilot projects were typically longer in duration than ETP projects, hiring someone new was often more feasible. However, the phased approach to funding created its own barriers to skills retention.

Additionally, with the time which has passed since funding was received, we can gain insight into the potential longer-term employment and skills impacts stemming from Pilot funding. We have some examples of strong employment and skills outcomes arising from Pilot funding, which are explored more in our case studies (see Section 3).

Still, whilst more time has passed since Pilot funding was first received, Pilot **technologies are often still in development and have yet to reach market**. For both the Pilot and ETP, we would expect the largest skills and employment benefits to accrue once technologies are commercialised or otherwise deployed.

3 Case studies

3.1 University of Bristol (ETP 03-032)

Academics at the University of Bristol partnered with a recent spin out company, Fathom, to improve flood hazard modelling using data from the Surface Water and Ocean Topography Mission (SWOT). The project combines cutting edge research at the University of Bristol with Fathom's ability to commercialise the next generation data generated. The project received £200k in funding under ETP Call 3. The project representative presented that this funding is expected to generate commercial benefits in the near future, as well as societal benefits from improved flood mapping, which will be crucial as climate change leads to more frequent and severe flooding.

Strengthening a valuable academia-industry relationship

ETP funding is strengthening an existing relationship between Bristol and Fathom, providing the necessary funding to keep the relationship active. This **partnership is opening up a direct route to commercialisation**, translating academic research into real world benefit.

> *"NSIP [ETP funding] was great because it sits between research development and the commercial space.*

Rapid commercialisation

Fathom already offers a global flood map product and so are ideally placed to quickly bring insights from Bristol's research to end-users. They estimate that **the improved data product developed through their ETP project could be on the market in as little as two years**. Bristol estimate that without ETP, the road to market could take twice as long. Commercial interest in this technology is evident with the team having already **raised £55k in private investment**. Fathom already have an established client base to leverage, who are always interested in more accurate flood modelling. This includes insurance and re-insurance companies, engineering consultants, larger businesses with ESG goals in mind and humanitarian organisations.

Clear potential for global benefit

If Bristol's work progresses as stated and this technology is successfully incorporated into Fathom's next generation product, **end users could benefit from higher quality flood mapping**. The technology is expected to increase the effectiveness of disaster risk reduction efforts, by enabling more targeted support. This has the potential to benefit people in flood prone areas, particularly those in some developing countries affected by disaster and conflict, who will have free and open access to this data through World Bank funding. Furthermore, insurance companies and engineering companies are interested in this data to better understand exposure to flood risk.

Increasing visibility and reputation in the sector

The **project team at Bristol have become the only UK-led SWOT science team**, reflecting the teams' strong reputation in water mapping and boosting the UK's global presence in this field. At least two academic papers are expected to be published across the consortium, directly linked to the ETP project. There are also plans to present the project at the December 2024 American Geophysical Union 2024 Annual Meeting – the largest geosciences conference globally. These activities showcase engagement within the wider scientific community.

3.2 Northumbria University (PILOT-N13)

Northumbria University's ongoing Pilot project is developing laser optical communications for CubeSats. The project has received three phases of funding with a combined total of £5.5m. The latter implementation phase is being undertaken with three partners: SMS Electronics, Durham University Centre for Advanced Instrumentation (CfAI) and Telespazio UK. Lockheed Martin UK are also involved with the project as a collaborator.

Innovation

Across funding phases, the **TRL has been raised from 1 to 5 for the product as a whole**, with a functional engineering model currently being built. However, **some sub-elements have been advanced to TRL 8**. This shows progress from a concept through to testing in a space qualified environment and movement towards the project objective of a TRL 8 system at the end of the project. The university noted that funding is valuable for supporting the project through the middle levels of TRL development which was regarded as a gap within the funding landscape. Another innovative outcome of the project was the **creation of a new detector design for their laser receiver system, which is going through a patenting process**, showing evidence of formal intellectual property creation and protection.

UK space sector competitiveness

The project aims to provide the UK's first commercial inter-satellite communication device for servicing clusters of small satellites and a uniquely compact design. It is also anticipated to capture a market with few commercial competitors. If progress unfolds as envisaged, it **will enable a step-change in communications for mega-constellations and space science missions**. To date, **the project team and supply chain has been entirely UK-based**, showing a strengthening of domestic capabilities and setting the stage a uniquely UK-built in-orbit demonstration mission.

Marketisation

The project representative noted that Pilot funding has accelerated the project's route to market, with the **aim of commercialisation by the end of 2025** for one of the payload sub-systems: the main processing board. There is also significant interest in the project's outputs by the MoD, as an all UK-built system is appealing for improving sovereign capabilities.

> *"We decided to accelerate [the commercialisation of] this processing board… This could be the most significant success story of our NSIP funding as it has many applications.*

Regional developments

Lockheed Martin's involvement has contributed to regional developments, with the Pilot project **establishing their presence in the North-East**. This was a key factor in the company's £15m investment into the £50m North-East Space Skills and Technology Centre (NESST) project, which is expected to deliver new testing facilities for laser communication systems. These facilities could create significant indirect impacts in the form of job creation, helping companies reach space flight readiness and providing a gateway for SMEs to enter the space sector.

Employment and upskilling

Eight job roles were created for this project including six post-doctoral researchers, one technician and one programme manager. We also heard that upskilling of existing employees occurred with the given example of a technician that was trained and promoted to a senior level role through working on the project.

3.3 Lynk Global (PILOT-N18)

Lynk Global is a company developing a network for global connectivity. With partners Farm.ink[48], a technology startup supporting farmers, and With Reason, a digital service consultancy, Lynk Global received £350,000 of NSIP Pilot funding for developments to LynkCast - an information broadcast system. The funding has advanced the company's mission of delivering ubiquitous connectivity across the globe via satellite direct to standard phones, enabling valuable humanitarian impacts.

Successful prototyping and demonstration activities

During the Pilot project, Lynk Global **successfully prototyped the broadcasting of weather information, reaching TRL 6**. This formed a foundation for their later demonstration of satellite to mobile agricultural weather alerts in rural Kenya. Although restrictions on the use of alerts limits initial service deployment, the company regarded NSIP Pilot as showcasing the utility of direct to phone broadcast technology. This utility has encouraged their continued development of LynkCast like capabilities for other uses.

End-user interest in LynkCast for natural disaster alerts has grown since the Pilot and thus, so has the project's potential humanitarian impact. Building off the utility of direct-to-phone broadcasts, exemplified under Pilot funding, Lynk Global developed their beta testing service of LynkCast. Small island states and countries characterised by large land masses, extensive coastal coverage and mountainous terrain have been actively interested in the Lynk D2D service. One example includes Lynk Global being approached by a small island state which had experienced a volcanic eruption and cut sea cables. The Lynk D2D service has subsequently been provided for the islanders via the local mobile operator, which can also aid connectivity in the midst of the natural disaster. This highlights **NSIP Pilot catalysing valuable humanitarian impacts**.

Developing infrastructure

Leveraging Pilot funding, Lynk Global **accelerated the manufacturing of their satellite services** that would be used for the company's satellite direct to phone capabilities. Although space demonstration was completed after the Pilot project completed – as the satellite was launched a month after the Pilot's end – **NSIP helped to reach flight readiness**. We heard how Pilot funding contributed to the service infrastructure developments crucial for realising the company's satellite direct to mobile connectivity. Lynk Global has since continued growing its constellation which now includes six satellites supporting their beta direct to mobile service.

Building relationships with regulators

We heard how important relationship building between Lynk Global and sector relevant regulators was nurtured by Pilot funding. The company noted that under the programme, **relationships were built with the Federal Emergency Management Agency (FEMA) and the Federal Communications Commission (FCC)** and other regulatory agencies around the world which helped increase their understanding of cell broadcasting processes. This helps ensure that the company's end-to-end activities fit within the regulatory landscape ultimately aiding the progression of the company's activities, including satellite launches, technology developments and the rolling out of mobile service.

Upskilling Opportunities

The Pilot project provided Lynk Global with upskilling opportunities for both their existing team and interning students. The former gained new experience building mobile services and the latter were supported with routes into the space sector.

[48] Farm.ink was a subsidiary of Learn.ink, but it is no longer in operation, although Learn.ink continues to exist.

4 Economic Evaluation

Our economic evaluation builds upon our impact evaluation, to provide a **rounded view of the success of the NSIP Pilot and ETP so far**. We combine a quantitative assessment of the benefits focussed on **monetisable impacts**, with the **qualitative insight** discussed in the proceeding sections to provide emerging answers to the key question, 'was it worth it?'.

The true value for money offered by the NSIP Pilot and ETP **will be determined in the long run** and will ultimately hinge on the success in bringing technologies developed under the programme to end users. These **benefits will take years or even decades to fully materialise** – funded ideas need to progress to higher TRLs, commercialise and deploy new products and services, and secure new market share. Even then, the bigger picture benefits are often the societal benefits that are secured as new satellite-based services offer (for example) productivity or welfare enhancing solutions on the ground.

At present, we can therefore capture only the early signs of future potential. The benefits we can see at this point in time are concentrated on funded organisations themselves. In future, if and when products reach end users, we might expect the spillover benefits to society to far outweigh these private benefits. Our analysis is based on a still evolving picture of benefits and represents an **early attempt** to assess the value for money associated with the NSIP Pilot and ETP. Therefore, in this Interim Evaluation, we focus on quantifying early benefits and provide a qualitative discussion of potential value for money associated with the programme. We expect any quantitative estimates of the benefit associated with the programme to underestimate the ultimate benefit of Pilot/ETP funding, particularly at this early stage.

In our Final Evaluation we will conduct a full economic evaluation of the Pilot and ETP. We expect more benefits to have materialised by this time, though this evaluation will for similar reasons will likely only be able to present a partial view of the ultimate economic benefit, which will take years to fully materialise. This is not a challenge that is unique to Pilot/ETP or space funding, but to public R&D funding more broadly.

4.1.1 Approach to economic evaluation

Our approach to economic evaluation is designed to holistically capture the benefits arising from funding, whilst recognising that the **benefits realisation journey is ongoing** and **our data on impacts is in places patchy**, particularly with regard to monetisable outcomes. This is especially true for the Pilot, where most projects have typically long-concluded and consequently it has been difficult to gather comprehensive data on impacts, given staff and organisational changes. There are also some gaps in our understanding of the impacts of ETP projects.[49]

At a high level, we compare the costs of delivering each programme to the benefits delivered so far. Costs include grant funding (the public cost) and matched funding contributions (the private

[49] We have made some changes to our methodology to reflect DSIT appraisal guidance. See footnote below.

cost). **The benefits we quantify are leveraged external investment[50,51], internal investment, GVA and the value of job creation**. Evidence on these impacts comes directly from our impact evaluation, supplemented by our quasi-experimental analysis. We estimate GVA using standard industry revenue to GVA ratios, disaggregated by organisation size[52]. The value of job creation is estimated using a **wage premia approach**[53] which assumes that in the absence of NSIP funding, those in roles created through funding would instead be working in similar roles outside the sector, earning different salaries[54]. A wage premia approach assumes that the economic value of job creation lies in creating new better paid roles, rather than new jobs per se.

For our central analysis we use **bottom-up estimates of job creation** taken directly from project teams. This is supplemented by a **quasi-experimental analysis of job creation** associated with the Pilot. This analysis leverages econometric techniques to robustly estimate the employment impacts of Pilot funding. At a high level, we compare the employment impacts in funded organisations with control groups of non-funded organisations, to estimate the additional job creation benefit associated with the Pilot. We find that receiving Pilot finding is on average associated with 3-4 new jobs for commercial organisations with less than 15 employees, and there is not enough data to discern any employment effect for large firms. If we assume that receiving Pilot funding creates 3.5 new jobs per funded organisation, this produces a top-down estimate of the job creation element of value for money. This is a strong assumption and therefore we treat this as an upper bound on job creation.

For the Pilot, we consider only realised benefits over a 5-year evaluation period since funding began (i.e. FY 2020/21 to FY2024/25). For ETP our central analysis covers realised benefits over the 3-year period since funding began (FY 2022/23 to FY2024/25) but we also estimate value for money if expectations are considered, over an 8-year period from FY2022/23 to FY2029/30. This period is chosen to reflect the period over which we have North Star Metric data on expected impacts[55]. All costs and benefits are adjusted to **current prices**, and **future benefits are discounted** using the standard 3.5% discount rate recommended by the Green Book. While we bound our analysis at these time horizons, we note that an assumptions-based approach to extent to a 10-year appraisal period (in line with HMT Green Book guidance) would lead to larger results.

Attribution of benefits is a key challenge to any economic evaluation, with impacts often stemming from multiple inputs in complex ways. Broadly, our approach has been to directly ask project teams for benefits which are linked to their NSIP projects. During interviews, we asked probing questions about the extent to which benefits could be attributed to NSIP. Where impacts are clearly the result of multiple inputs, an attribution share has been assumed. Non-UK benefits have also been removed to account for leakage, i.e. the extent to which benefits accrued outside of the UK, such as non-UK jobs and external investment into non-UK arms of funded organisations. We then apply a 90% additionality assumption to all benefits to account for deadweight, i.e. a small proportion of economic activity generated would likely have gone ahead without NSIP funding. For example, some organisations indicated that they may have received funding through other

[50] Throughout our analysis we treat external and internal investment as benefits to society, reflecting the positive role of investment in creating a pipeline for future economic benefit and the central role of investment in the UK Space Agency's North Star Metric. However, we note that DSIT appraisal advice focusses on quantifying the benefits which stem from investment, which are likely to accrue over the longer term. UK external and internal investment are therefore counted as a cost by DSIT, reflecting the opportunity cost of investment. Foreign investment is not included in the cost-benefit calculation. This methodology will capture the long-term benefit of investment but for the Pilot/ETP, it is too early to meaningfully calculate net present social value (NPSV) using this approach.
[51] We include private external investment and foreign public external investment (including ESA funding) in our totals.
[52] These are sourced from the Size & Health of the UK Space Industry 2022 underlying economic model.
[53] know.space (2023). *Estimation of wage premia associated with UK Space Agency funding*.
[54] Using contextual information, job creation is divided into sub-categories of role type and seniority. The wage premia associated with each job type is then taken from know.space (2023). *Estimation of wage premia associated with UK Space Agency funding*. Estimates of wage premia are adjusted to current prices. For a fuller description of the methodology employed, see ibid.
[55] As discussed below, already it is clear for some metrics that expectations are not being realised. Where this is the case, we assume that projected benefits are delayed and kick-in from next year.

sources, if not NSIP, or attempted to self-fund work more slowly. Below, **we discuss the extent to which benefits are attributable**, leveraging insights from our impact evaluation.

4.2 NSIP Pilot projects

Our interim economic evaluation of the Pilot is built on a partial evidence base and results should therefore be treated with caution.

4.2.1 What has been the monetisable benefit?

We estimate that the real discounted and attribution-adjusted **UK benefit of the Pilot is at least £72m to date**. This total is **driven by a few large external investment deals which account for around 99% of the benefit** (£71m)[56] arising from the Pilot. £20m (28%) of this is UK investment and £52m (72%) is foreign. Of this £72m, Real GVA and job creation account for less than £500k in benefit each. We have no evidence of internal investment benefits.

Reflecting the importance of a few large investment events driving outcomes, benefits fluctuate hugely year-on-year, depending on whether an investment event took place and its magnitude.

Table 3 *Real discounted benefit from the Pilot by year*

	2020/21	2021/22	2022/23	2023/24	2024/25
Total real discounted UK benefit	£0.1m	£42.3m	£0.3m	£16.3m	£13.2m

We also investigate what the total economic benefit would be using a top-down approach to estimating job creation. These top-down estimates should be seen as an upper bound on potential job creation benefits, given concerns about robustness. **Based on the quasi-experimental results and assuming that each Pilot-funded organisation creates 3.5 new jobs, around 300 new jobs have been created from Pilot funding**[57]. Using a wage premia approach[58] we estimate the economic value of these new jobs to be £2.3m, considerably more than the £460k resulting from our central, bottom-up approach. This in turn implies a larger total real discounted benefit of £74m. External investment events still drive total benefit, but job creation plays a non-negligible role.

Given the small sample size on which our quasi-experimental results rest and the consequent concerns about robustness, **we choose to rely on reported job creation data for our central bottom-up analysis**. However, we note that these data likely underestimate total benefit due to data gaps. We expect the true value of employment creation to lie between these two estimates.

4.2.2 To what extent are benefits attributable to NSIP?

All results presented have been adjusted for attribution. The appropriate level of attribution is considered for individual benefits and our totals are also subject to a 90% additionality assumption[59] to account for deadweight, since our interviews suggested that a small minority of projects may have gone ahead without NSIP funding. Our assumptions about the extent to which benefits are attributable to NSIP are crucial to determining total monetisable benefit. In particular, given the extent to which a few external investment events drive overall benefits, **results are**

[56] Totals only include private and non-UK public investment, and have been attribution-adjusted, so may not match those represented in the Impact section.
[57] We estimate that 86 individual UK organisations were funded across Pilot calls. 3.5 new jobs is an average across funded organisations.
[58] know.space (2023). *Estimation of wage premia associated with UK Space Agency funding*.
[59] This means that we include 90% of total reported benefits.

highly sensitive to our assumptions about the extent to which external investments are attributable to NSIP.

Given the importance of the attribution associated with external investment, we **individually researched each investment event and assigned an attribution share** based on this qualitative insight. For example, one project team made it clear that their external investment would not have happened without Pilot funding, so we assume 100% attribution. However, another company receiving investment explained that they had received funding from other sources beyond NSIP so their external investment deals cannot solely be attributed to NSIP. In this case (using a reasoned judgement call) we assumed 40% attribution. This 40% assumption is necessarily somewhat arbitrary, and results are sensitive to this assumption. If we instead assumed 25% attribution, the overall real discounted UK benefit from the Pilot would drop from around £72m to £60m. If we assume 50% attribution, the benefit would instead be £80m. Given this sensitivity, we should not overly rely on monetised estimates to assessing the extent to which the Pilot has offered value for money.

Since the Pilot International call specifically targeted international collaboration, we would expect a strong degree of leakage associated with the Pilot (i.e. significant benefits accruing outside the UK). Only UK benefits (i.e. benefits to UK based organisations and individuals) have been included in our totals[60]. Mindful of potential leakage, project teams were specifically asked to report UK-based revenues and job creation (and our quasi-experimental results only capture UK employment). External investment events were investigated to ensure investment was going into the UK. One large NASA investment – which had a credible link to NSIP funding - was removed from our economic evaluation totals since investment was targeted at the US branch of a funded organisation.

Crowding out (i.e. public investment displacing private investment) was deemed to be insignificant based on conversations with project teams, who consistently made it clear that private investors would not be interested in their technology without prior de-risking through government funding at the relatively lower TRLs funded by Pilot and ETP (see Section 2.1.3).

Displacement (i.e. the extent to which economic activity generated by NSIP displaces other activity in the economy) was also considered. **For revenues, external and internal investment, we assume zero displacement,** as the UK is assumed to be capturing a share of emerging global markets which brings new economic activity to the UK. For job creation, our DSIT-recommended wage premia methodology implicitly assumes 100% displacement, i.e. everyone in a job created by NSIP would otherwise be working in a similar job outside the space sector. We believe this is a reasonable assumption given the economy was operating near full employment over much of the period of analysis.

Lastly, building off the conclusions of the counterfactual sections presented above, we believe that **the deadweight associated with the Pilot is likely to be low**, with most projects not going ahead in the absence of funding. However, some teams indicated at interview that they may have found funding through other sources, so we conservatively apply a 90% additionality adjustment to our totals.

4.2.3 How significant are non-monetisable benefits?

So far in our economic evaluation, we have focussed on monetisable benefits, but we believe that **non-monetisable benefits are central to evaluating the overall value for money offered** by the Pilot. Key benefits of Pilot funding are intrinsically non-monetisable, notably the facilitation of crucial steps towards commercialisation. Furthermore, data gaps limit the robustness of our quantitative assessment of benefits, so we should not over rely on monetised estimates. Our

[60] Given our evaluation is focussed on assessing UK benefit, we did not explicitly consider the extent to which benefits have accrued outside the UK or the benefits of Pilot International projects to international partners.

impact evaluation provides an in-depth analysis of benefit creation, demonstrating the considerable benefits arising from funding, so we do not repeat this analysis here. We instead provide a brief overview of the key non-monetisable benefits of Pilot funding and attempt to qualify their relative significance in determining overall value for money.

Pilot funding has enabled innovative technology development. Whilst we have incomplete data on TRL advancement, there are numerous examples of innovation across projects, which is bringing technologies closer to market. It is difficult to place a monetary value on TRL increases because **the economic value of these technologies will ultimately be realised when they reach market**, generating revenues and benefit to end users. Also, some of these technologies will never reach market, though the knowledge gained may be applied elsewhere through knowledge spillover benefits and technology transfers. Therefore, we do not attempt to monetise technology improvements but note that **significant future economic value is likely to be contingent on this technology development**.

Pilot funding has – we frequently heard - also provided a '**stamp of approval**' for funded organisations, with many stressing the reputational benefits of being funded by UK Space Agency. These reputational benefits are arguably impossible to measure but lay the groundwork for future investment and customers, so should be considered an important benefit.

Our analysis of the societal benefits of Pilot projects revealed that **all Pilot projects have the potential to deliver social benefits**, with all projects linked to at least one UN SDG and the majority of projects applicable to tackling climate change. However, these benefits will only be realised if and when technologies make it to market. This means that the economic benefit is currently near-zero, despite the potential for widespread social benefit. These benefits should not be ignored because they cannot be monetised. Again, this ties to the wider point that the ultimate value for money of Pilot/ETP-funded projects will ultimately hinge on whether new products and services are ultimately successfully developed, rolled out, and secure market share.

Even if a given technology developed under the Pilot fails to reach market, there will nonetheless be **benefits realised through project delivery**, which are difficult to monetise. Notably, new and strengthened partnerships are already leading to further collaboration, enabling knowledge sharing with potential for new innovative technologies. Pilot funding also enabled the upskilling of project teams. Ultimately, we would expect these more skilled individuals to be more productive, generating greater economic value for the economy and earning higher salaries, as they apply their skills elsewhere.

Lastly, the Pilot has intrinsic value in generating new knowledge. This is particularly true for academic organisations who focussed on more fundamental research. Whilst this knowledge may never deliver pure economic benefit, we should not forget the value of knowledge for its own sake.

4.2.4 How much has the Pilot cost?

Overall, we estimate that **the total nominal economic cost of the Pilot has been £41.5m**, of which £28.1m came from grant funding and £13.4m came from matched funding[61]. All spend in 2020/21 was on Pilot 2020 and International call projects. Thereafter, all spending is associated with the Implementation phase. Whilst we do not have estimates for anticipated spend on the Implementation phase, the Pilot 2020 and International calls cost far less than the anticipated £15m in grant funding.

[61] Note that whilst we include external and internal investment as a benefit, DSIT appraisal advice considers UK external and internal investment as a cost, reflecting the opportunity cost of investment.

Table 4 How much did the Pilot cost[62] ?

Cost type	2020/21	2021/22	2022/23	2023/24	2024/25
UK Space Agency grant funding	£10.7m	£6.79m	£0.44m	£4.73m	£5.46m
Matched funding	£3.29m	£2.92m	£0.19m	£3.12m	£3.85m

4.2.5 Is the Pilot offering value for money?

Overall, it is **too early to conclude whether the Pilot will offer good value for money**, but the early signs are promising, especially once we bring in qualitative evidence of benefit. Looking holistically at the benefits coming from Pilot activity, our overarching conclusion is that – while data limitations inhibit our ability to draw highly robust conclusions – the Pilot appears on track to deliver good value for money. **Future evaluation will be crucial to drawing firmer conclusions**.

4.2.6 How do realised benefits compare to expectations?

Comparing realised benefits to expectations at the beginning of the programme is challenging given data gaps and changes in programme scope. We compare realised benefits with expected benefits as laid out in the original 2020 NSIP Pilot Business Case. However, given the 4-year lag on any benefits realisation assumed in the business case, it is challenging to provide meaningful comparison, since any benefits realisation to date would count as overperformance. Moreover, the largest benefits from the Pilot are anticipated to accrue in future years and **any findings should be treated with caution** given the paucity of available evidence. **Differences in methodology may explain much of the difference in expected and realised outcomes**. What is clear is that the Pilot is delivering real economic benefits.

The 2020 Pilot Business Case lays out the case for £15m in grant funding to be spent in FY2020/21. A Preliminary Value for Money Analysis estimated that £15m in NSIP grant funding could lead to £166m in real discounted benefit. This is equivalent to a **net present social value (NPSV)** of £133m and **a standard assumed space industry NPSV / departmental expenditure limit (DEL) of 8.8**[63]. Benefits were appraised over a 19-year period with a 4-year lag in benefits realisation. These estimates are based on standard space industry parameters[64].

[62] Data on costs was sourced from application forms and therefore represents planned spend. There may be some discrepancies between planned spend and actual spend, with some projects coming in under budget, whilst others requested cost extensions. Additionality, this total does not include in-kind contributions from project teams, for example, use of facilities or staff overtime. These totals are designed for the purposes of our economic evaluation, rather than accurate financial accounting.

[63] These estimates were based on data from multiple successive years of funding, assuming that Pilot funding would continue beyond FY2020/21. Given many projects went on to receive Implementation phase funding, this assumption largely holds.

[64] The UK Space Agency used a top-down approach to analysis, leveraging assumptions drawn from BEIS Science and Research Analysis (2017) NPV Model Guidance on expected NPSV/DEL. The appraisal period was adjusted using space-specific evidence from London Economics (2015) *Returns to Public Space Investments*. Available at: LE-UKSA-Return-from-Public-Space-Investments-FINAL-PUBLIC.pdf

Table 5 *UK Space Agency preliminary NPV analysis for the Pilot 2020 and International Calls*

Preliminary NPV Analysis of £15m space investment	(real, discounted £M)	Sensitivity: Optimism Bias		
Cost to the Exchequer	15			
Cost to the UK Private Sector	18			
Total Costs (Real, Discounted)	33	with 75% of benefits	with 50% of benefits	with 25% of benefits
Benefit: Public Investment	32			
Benefit: UK Private Sector *direct*	30			
Benefit: UK Private Sector *spill-over*	104			
Total Benefits (Real, Discounted)	166	124	83	41
NPV	**133**	**91**	**50**	**8**
NPV/DEL	**8.8**	**6.1**	**3.3**	**0.5**

Source: UK Space Agency (2020). National Space Innovation Programme (NSIP) Business Case

Differences in methodology constrain our ability to provide meaningful comparison at this stage. In comparison to the timeline of benefits realisation set out in the business case, **NSIP appears at first glance to be delivering greater value for money than expected at this stage**. The business case assumed that benefits would be realised with a 4-year lag, with the first benefits accruing in 2024/25. We have some quantitative evidence and strong qualitative evidence that significant benefits have been realised prior to this point. Though the Pilot is delivering far greater benefit than economic modelling at appraisal stage assumed at this stage, this should be viewed more as an indication that the 4-year lag assumption was a placeholder assumption than an indication that the Pilot has hugely over exceeded expectations[65]. **We cannot meaningfully comment on the extent to which the Pilot is comparing with expectations**.

It is still too early to determine the ultimate economic impact of the Pilot, and **we expect further substantial benefits to accrue in coming years**. Revisiting these questions in the Final Evaluation will offer more insight into the eventual impact of the Pilot, but benefits will continue to accrue for many years beyond the Final Evaluation.

4.3 ETP projects

Our interim economic evaluation of ETP is very early stage and is built on an incomplete evidence base, so results should be treated with caution.

4.3.1 What has been the monetisable benefit?

We estimate that the **real discounted and additionality-adjusted benefit of ETP to date has been at least £1.9m**. This number is driven by internal investment worth £1.3m to date. We also estimate external investment worth £480k, of which 74% is UK investment, and job creation and GVA worth approximately £70k and £50k respectively. These numbers are driven by examples of impact.

Breaking benefits down by year, we see a **clear trend of increasing benefit over time** from a relatively negligible amount (£4k) in 2022/23 to £1.4m in 2024/25. This is to be expected given in 2022/23 only ETP call one was running. Even now, many projects are ongoing.

[65] This assumption has since been updated to 2 years for 'technology development' investments in know.space (2022) *Returns and Benefits from Public Space Investments 2021*.

Table 6 *Real discounted benefit from ETP by year*

	2022/23	2023/24	2024/25
Total real discounted UK benefit	£0m	£0.5m	£1.4m

Given we are evaluating impact at an early stage, the **largest benefits are expected to accrue in future**. Notably, **no products have reached market yet**, so revenues associated with ETP are minimal. External investment is also low with project teams stressing that external investment is only likely to be generated after further de-risking through additional grant funding. Internal investment and job creation are also likely to increase in future, once the technology is further de-risked.

Reflecting this, we also estimate monetisable benefit over the 2022/23 to 2029/30 period including expectations in our totals. These **forward-looking estimates should be treated as indicative only** for several reasons. Firstly, there is potential for strong optimism bias in expectations. We apply a 50% optimism bias adjustment[66] given a demonstrated systematic tendency for individuals to over-estimate future benefits, but at this stage **we lack robust evidence of the extent to which optimism bias affects forecasts**. Secondly, we only have data on expectations for ETP calls Two to Four, with no data on expected external investment for Call Two. We also note that **the full benefit from ETP funding may take many years to materialise** and therefore even our forward-looking estimate only captures a proportion of the ultimate expected benefit from ETP.

Notwithstanding these caveats, once we include expected benefits, the **total real discounted and additionality and optimism bias-adjusted benefit of ETP rises to £40m**. This total is driven by external investment of £23m, followed by £11m in GVA and £5m in internal investment. Interestingly, job creation is still only worth £690k over this period, reflecting the low economic value a wage premia approach places on a single new job given our full employment assumption.

Our **estimates are driven by individual anticipated investment events**, which creates significant year-on-year fluctuations. For example, a single £25m anticipated external investment event drives our 2029/30 total. Some organisations were buoyant in their expectations, whilst others were very conservative, with many organisations not forecasting any external investment.

Table 7 *Real discounted benefit from ETP by year, including expectations*

	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Total real discounted UK benefit	£0m	£0.5m	£1.2m	£4.4m	£2.8m	£7.2m	£5.5m	£18.5m

4.3.2 To what extent are benefits attributable to ETP?

As in our economic evaluation of NSIP Pilot, we apply a **90% additionality adjustment** to our benefit estimates. Our estimates of realised benefits are derived from interviews with project teams where we probed attribution and a survey, where questions were framed to only collect data on benefits linked to ETP. Our estimates of future benefits are derived from North Star Metric reporting at application stage where applicants were asked to 'demonstrate how the grant funding will lead to investment and contract revenue'. The application form clearly distinguished between UK and non-UK impacts. Given the answers provided, **we view that attribution of benefits to NSIP is high, and leakage is low**.

[66] 50% is necessarily a somewhat arbitrary number without concrete evidence on the extent to which optimism bias is prevalent. In future evaluations, we will attempt to assess the degree of optimism bias in these estimates. We chose 50% to reflect *Supplementary Green Book Guidance*, available at: https://assets.publishing.service.gov.uk/media/5a74dae740f0b65f61322c72/Optimism_bias.pdf

The evidence suggests that **crowding out associated with ETP is low**. Given the low TRL nature of supported technologies, private investors were unlikely to fund technology development without prior de-risking from government.

Similarly to the Pilot, **we assume zero displacement for revenues and external and internal investment**, but our wage premia methodology implicitly assumes **100% displacement for job creation**.

We assume that the **deadweight associated with ETP is low but non-negligible**, so assume 90% additionality. Interviews with project teams and unsuccessful applicants suggested that projects may have gone ahead in the absence of funding through other funding sources (e.g. CEOI)[67].

4.3.3 How significant are non-monetisable benefits?

The evidence suggests that the **non-monetisable benefits from ETP are large** and should drive any evaluation of the extent to which ETP is delivering value for money. Similarly to Pilot funding, the overarching benefit of ETP to date has been in facilitating steps towards commercialisation, though for ETP this conclusion should be even stronger given the early TRLs targeted by funding. We expect the greatest benefits from ETP to accrue once technologies are commercialised. Therefore, **the most significant benefits today lie in moving products closer to commercialisation**, but these movements are arguably impossible to monetise at this stage.

Despite the fact that many projects are still ongoing, technologies developed under ETP have on average had their TRL raised by 1.8. This **TRL development cannot be monetised, but is a key benefit of ETP**, bringing technologies to a level where project teams can explore a wider range of options for future funding, as technologies are de-risked. For example, through an NSIP Major Project or private investment. Project teams are also learning important skills, which can be leveraged in future work and boost their productivity.

The reputational benefits delivered by ETP, including the UK Space Agency 'stamp of approval' effect discussed in previous sections, also open up future opportunities for project teams. Meanwhile, similarly to the Pilot, **ETP projects are expected to deliver strong societal benefit once they are commercialised**. These benefits are not monetisable but represent a large source of potential future benefit. ETP projects are also generating substantial new knowledge, with the majority of projects led by academic organisations.

4.3.4 How much has ETP cost?

Overall, we estimate (for the purposes of economic modelling, using simplifying assumptions, rather than an accurate breakdown of spending) that the total nominal economic cost of **ETP will be £10.8m, of which £8.5m comes from grant funding and £2.3m comes from matched funding**[68]. Total economic cost, including matched and grant funding, was £2.6m in Call 1 and £3.3m in Call 2. We expect Call 3 will have a total funding allocation of £2.6m and ETP Call 4 £2.3m. Below we provide a breakdown of costs by financial year across calls[69].

[67] We note that it is possible that unsuccessful applicants were unsuccessful because their projects were perceived to have a high deadweight.
[68] Data on costs was sourced from application forms and therefore represents planned spend. There may be some discrepancies between planned spend and actual spend, with some projects coming in under budget, whilst others requested cost extensions. Additionality, this total does not include in-kind contributions from project teams, for example, use of facilities or staff overtime.
[69] This represents an indicative estimate of spend per year, based on milestones set out in application forms. In a minority of cases, where milestones could not be obtained, a simplifying assumption was used that funds were spent evenly over the lifetime of a call.

Table 8 *How much will ETP cost?*

Cost type	2022/23	2023/24	2024/25
UK Space Agency grant funding	£0m	£4.5m	£3.9m
Matched funding	£0m	£1.1m	£1.1m

4.3.5 Is ETP offering value for money?

It is **early to evaluate whether ETP is offering value for money** given the programme targets low TRL technologies and many projects are still ongoing. However, we can see evidence of significant future benefit and therefore ETP appears on track to deliver good value for money. In our Final Evaluation we will be able to provide more robust conclusions on the extent to which ETP is generating value for money.

4.3.6 How do realised benefits compare to expectations?

We do not have any expectations of the economic impact of ETP from appraisal at the business case stage[70], but we can compare the expectations of applicants at proposal stage to realised outcomes so far. From ETP call 2 onwards, applicants were required to provide estimates of future economic impact over the next 6 years as part of North Star Metric reporting[71]. Applicants provided estimates of future leveraged external investment, internal investment, revenues and job creation associated with receiving ETP funding. With the **important caveat that there are gaps in reporting**, at this stage, our evidence suggests that **these estimates were generally very optimistic**. Still some benefits have been realised to a greater extent than others.

External investment

At application stage, ETP applicants (Calls 3-4) estimated that they would leverage £3.6m in external investment in 2023/24 and £3.1m in 2024/25. To date, we have evidence of just £530k of external investment raised by these organisations, far less than expected.

Table 9 *External investment: expectations versus reality*

	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Expected external investment	£0m	£3.6m	£3.14m	£13.35m	£7.35m	£35.5m
Realised external investment	£0m	£0m	£0.53m			

Note: Expected values only cover ETP calls 3-4, where we have data on expected external investment.

Internal investment

Expectations for internal investment have been largely realised – albeit at relatively early stages in the longer term story. In 2023/24, funded organisations (ETP Calls 2-4) raised more than predicted and, with 2024/25 still ongoing, funded organisations have raised the majority of expected internal investment this year.

Table 10 *Internal investment: expectations versus reality*

	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Expected internal investment	£0m	£0.35m	£1.29m	£1.63m	£0.9m	£1.13m
Realised internal investment	£0m	£0.53m	£0.89m			

Note: Expected values only cover ETP calls 2-4, where we have data on expected internal investment.

[70] We (know.space) do not have the original ETP Business Case.
[71] Note: we do not have any data on expected external investment for ETP Call 2.

Revenues

Expectations of future revenues far exceed realised revenues. Over £11m of revenues were forecast in 2023/24, though we have no evidence of realised revenues in this time period. In 2024/25, over £5m in revenues were expected though we have evidence of just £130k in revenues so far (though note that there may be a reporting lag at play).

Table 11 *Revenues: expectations versus reality*

	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Expected revenues	£0m	£11.1m	£5.3m	£8.6m	£15.6m	£25.4m
Realised revenues	£0m	£0m	£0.13m			

Note: Expected values only cover ETP calls 2-4, where we have data on expected revenues.

Job creation

Lastly, our evidence suggests that job creation has been far lower than expected. To date, we have evidence of just 16 new jobs. Applicants forecast 46 new jobs in 2023/24 alone. However, incomplete data may explain some of this difference.

Table 12 *Job creation: expectations versus reality*

	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Expected job creation	7	46	63	73	82	101
Realised job creation	0	3	13			

Note: Expected values only cover ETP calls 2-4, where we have data on expected job creation.

Reflections

Overall, our evidence suggests that **North Star Metric data collected at proposal stage considerably overestimated the potential for future benefit**, with the exception of internal investment. This analysis should be treated with caution given gaps in our data (37% of organisations failed to respond to our survey). However, for external investment and revenues in particular, the evidence is overwhelming.

There are likely several reasons for this difference between expectations and reality. Firstly, as mentioned, **there will be gaps in our data**. Some of these arise from non-respondents, but we suspect gaps also exist due to a lack of understanding of economic terminology amongst funding recipients[72]. Additionally, many external investment deals are commercially sensitive and organisations may be unwilling to disclose this information. Secondly, there is potential for **optimism bias**. These numbers are intrinsically hard to estimate, and optimism bias is standard in benefits projection exercises - **no applicant thinks that their project will fail, but in early-stage R&D, many will**.

> *“There is a demonstrated, systematic, tendency for project appraisers to be overly optimistic[73].*

Beyond this, there is arguably an **incentive for applicants to present an overly positive view** of potential benefits at application stage to secure funding, though reviewers may discount estimates they believe are unrealistic[74]. Some applicants were particularly candid about this incentive.

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[72] Comments at interview and in survey notes demonstrated a common lack of understanding from funding recipients. In particular, it seems many respondents conflated internal investment with matched funding. Where a respondent had clearly misunderstood the question (i.e. the totals were the same exact amounts), these answers were removed from our totals.
[73] HM Treasury (n.d.) *Supplementary Green Book Guidance*. Available at: Microsoft Word - GreenBook_optimism_bias.doc
[74] Our interviews with reviewers suggested this was the case, with reviewers given the freedom to make reasoned judgements.

> *North Star Metric numbers cannot be true… it's very finger in the air and may as well make (you) look good.*

Still, this represents only an **early assessment of progress** against North Star Metric expectations. It is possible that **benefits may be realised with a lag**. In our Final Evaluation, we will be able to compare more years of data to gain greater insight into the extent to which expectations are being met.

4.4 Discussion

Our economic analysis has provided a snapshot of the extent to which the NSIP Pilot and ETP are offering value for money at an **early stage in a much longer benefits realisation timeline**. We expect that the largest benefits from funding will accrue once technologies are commercialised (or otherwise deployed), delivering more widespread societal benefit. Our quantitative analysis is further limited by the extent to which benefits can be monetised and rests on an **imperfect evidence base**, especially for the Pilot.

As with any evaluation of R&D investments, **attribution of benefits is a key challenge**, and results are highly sensitive to our assumptions. We have taken a reasoned approach, inferring additionality and attribution assumptions from qualitative evidence gathered from funded organisations. It is clear that substantial benefits have accrued from funding, but **monetised estimates should be evaluated alongside qualitative evidence of benefit creation**.

There are promising signs that the Pilot will deliver good value for money, but it is **too early to draw firm conclusions**. We estimate that the Pilot has delivered **at least £72m in benefit to date**, of which nearly all (£71m) is associated with catalysed external investment. Results are driven by strong examples of impact, and we expect this total to represent an underestimate of the benefit delivered to date by the Pilot, given data gaps.

At the time of analysis, no ETP technologies have been commercialised and many projects are still ongoing. The key impact of funding lies in **laying the foundations for future benefit**, notably by de-risking technologies for future investment. Nonetheless, we estimate that ETP has generated **at least £1.9m in benefit to date**, of which £1.3m is internal investment.

If we include expected impacts, the **total real discounted and additionality and optimism bias-adjusted benefit of ETP rises to £40m**. North Star Metric projections of job creation, revenues and internal and external investment suggest strong potential for future benefit, but we should be mindful of the potential for **optimism bias** in forecasts. Our early comparison of realised versus expected benefits for ETP suggests that North Star Metric forecasts may be overly optimistic.

Continuing to track the benefits arising from the Pilot and ETP over the coming years will be crucial in assessing the extent to which the programmes have offered value for money. At present, it is too soon to draw firm conclusions on the extent to which the Pilot and ETP have offered good value for money. However, throughout our analysis, we have pointed to **varied and substantial benefits** resulting from funding. We will revisit these questions in our Final Evaluation, estimating the NPSV and NPSV/DEL associated with Pilot/ETP funding.

5 Conclusions

Our impact evaluation, presented in Section 2, seeks to address the following evaluation questions:

- *To what extent has NSIP catalysed innovation and the development of disruptive technologies?*
- *To what extent has NSIP supported organisations to capture an increased market share in target sectors/ sub-sectors?*
- *How has NSIP contributed to the development and international competitiveness of the UK space sector?*
- *What impacts has NSIP had on skills, knowledge, and capabilities within the UK space sector?*
- *To what extent has NSIP delivered scientific or societal benefits in the UK?*
- *What has been the extent of each element of economic additionality?*

For all of these questions, from the perspective of Pilot and ETP funding there is a similar narrative. This boils down to there being a **number of positive signals to highlight, and tangible outcomes on which to report**, though at the same time we are – inevitably – at a relatively early stage in the longer-term impact process which limits the ability to come to definitive conclusions on the success or otherwise of the programme at this stage. **The success of the Pilot and ETP as programmes will ultimately be determined by the longer-term success (or otherwise) of funded projects, and whether new products and services successfully reach market, secure investment (where relevant), and gain market share**. At the current time, we are reporting on emerging impacts, with Piot and ETP funding often acting (in the words of one interviewee) as a "necessary stepping stone" on the way to reaching market.

The impacts we report on are, nonetheless, very real. For example, significant TRL raising has undoubtedly occurred and the Pilot and ETP both appear to be **on course to meet the broader NSIP programme objective of raising TRLs by at least 2**. Around **£15m of matched funding** has been leveraged through UK Space Agency funding. There are also real-world examples of funded organisations securing investment with a credible link to Pilot/ETP funding, as well as **new patents, publications, research breakthroughs, examples of knowledge exchange, UK supply chain effects, and skilled jobs** being created.

Our survey – which was distributed to ETP project teams (though not Pilot teams, due to the length of time that has passed since their project and the decision to therefore focus on gaining insights through interviews) – also found strong evidence of positive impacts from ETP funding. For example, the overwhelming majority (typically 80%+) of respondents reported **reputational gains, strengthening of their competitive offerings, productivity benefits, improvements in technical skills, and broader benefits to the UK space industry's reputation and leadership**.

There is also a common theme around **spillover impacts**. A notable example was a Pilot project that was ultimately unsuccessful in terms of its objectives, but where the company subsequently went down a different (non-space) path using the knowledge generated, with the Pilot funding being noted as having played an important role in helping the company secure sizeable investment ($100m / £80m) and secure new revenues and exports. While not wholly attributable to Pilot funding, the relevant **interviewee told us that they had "no doubt" that the funding helped them to raise investment and led to new revenues, exports and jobs being secured**

more quickly. Beyond this example, we heard examples (albeit relatively small numbers) of new spin-outs, collaborations and ideas that stemmed from their Pilot or ETP funding.

Both the Pilot and ETP are, in our view, marked by **high additionality**. Our discussions of the counterfactual within each section highlight that, almost unanimously, project teams said that the projects and technological development seen would not have taken place in the absence of UK Space Agency funding, and this was reinforced by unsuccessful applicants who typically said either that their idea had not been taken forward, or that it had been progressed overseas. Many partnerships were created that otherwise would not exist, and where they already existed, we heard a consistent view that funding has helped to strengthen them. Funding was described by an interviewee as a "nucleation point" that often enabled ideas to be turned into something concrete.

Of course, in the absence of Pilot and ETP funding, it is likely that these ideas and the people behind them would in many cases have sought other funding vehicles – whether UK Space Agency, ESA, or other routes. This element of the counterfactual is difficult to clearly define as it relies on a number of "what ifs?", and funded researchers would no doubt have pursued other, productive activities that would have led to different benefits. However, what is clear is that **both the Pilot and ETP have led to technological advancement today that would not otherwise have been seen to the same timescales**. Linked to the above point around the long-term success being determined by the success of Pilot/ETP-derived products and services if and when they ultimately reach market, we therefore view that funding has put teams on a path to potential future benefits that they typically would not otherwise be on.

Few new products and services have yet reached market, so many of the longer-term benefits are yet to be seen. This is not unexpected given the typically low TRLs of projects funded under both strands, and it is important to have realistic expectations on what should be expected from a low-TRL focused programme at a point in time when many (ETP) projects are still ongoing.

The bigger picture story, therefore, is typically one of expectations. Much of the evidence we collected and assessed was based on forecasts, and interviewees reporting that while they had not yet secured new revenues, investment, or reached market, they expect to do so in coming years. For example, we received evidence of at least 35 new technologies, products or systems expected to be commercialised in the future, attributable at least in part to Pilot and ETP funding. A similar story was heard for market access: a few firms report already having accessed some new market segments as a result of their funding and secured some (relatively low) new revenues, but with much higher numbers expected in future. The same is true for scientific impact, i.e. limited impact so far (18 publications and a relatively low number of citations, albeit with gaps in the evidence base) but stronger longer-term expectations.

While **we are sceptical of some of the numbers reported at application stage on North Star Metric style outcomes** (to quote one funding recipient, "it's very finger in the air and may as well make (you) look good"!), they are nevertheless indicative of strong expectations. While our evidence here is incomplete, as Pilot projects predated North Star Metric reporting requirements, 20 ETP projects self-reported **£67m in expected attributable income** in the six years since their project started. Two Pilot projects also reported expected revenues of £5m and **£190m** respectively. On investment (a key overarching NSIP objective) **ETP teams forecast £63m in external investment and £5.8m in internal investment** in the six years since project start.

However, there **is limited evidence of being on course to meet these ambitious forecasts at this stage**. While our evidence base is incomplete, **realised outcomes to date are much smaller**, such as £550k of internal investment and £160k in private investment reported for ETP. There are some 'big win' examples such as the spillover company discussed above and their success in securing investment (with a credible link to their Pilot funding).

In general the common theme we heard is that **the investment story is "only just starting"**. For example, in ETP we heard examples of at least 12 ongoing discussions about securing investment, and **13 projects noted that UK Space Agency funding has increased their likelihood of securing private investment**, with a common theme around the **stamp of approval** effect that funding can have. On the other hand, and linked to the 'valley of death' point that often affects mid-TRL technologies and projects, many interviewees were keen to stress that **further public funding is needed** to develop their product or service before they will be ready to seek investment. This question of 'what comes next?' is an important one that was often raised, in many cases without clear answers.

The economic evaluation (Section 4) directly addresses the following questions:

- *What is the socio-economic benefit of NSIP to the UK?*
- *What has been the total UK cost of NSIP, including both public and private costs?*
- *To what extent do the net social benefits from NSIP (those that have been realised to date and those that are expected) justify public investment?*
- *To what extent do the benefits from NSIP outweigh the costs?*
- *How do the actual outcomes differ from anticipated costs and benefits?*

The answers to these questions typically mirror the answers to the impact evaluation questions, namely in that **while there are tangible and monetisable impacts that can be measured at this stage, the long run value for money of Pilot and ETP funding will depend on the ultimate success and market capture of funded technologies**.

We quantify leveraged external investment, internal investment, GVA and the value of job creation. We use evidence collected through the impact evaluation, supplemented by **econometric / quasi-experimental analysis**, and use a **wage premia** approach which assumes that in the absence of Pilot/ETP funding, those in roles created through funding would instead be working in similar roles outside the sector with different salaries.

For the Pilot, we estimate that the real, discounted and attribution-adjusted **UK benefit of the Pilot is at least £63m to date**. This total is driven by a few, large **external investment deals which account for around 98% of the benefit** arising from the Pilot. The value of employment creation here is based on actual jobs data.

As an alternate approach, we use the finding from our quasi-experimental analysis which found (with caveats) that **Pilot funding is associated with 3-4 new jobs**. Applying this to the Pilot more broadly we estimate that funding would lead to the creation of around **300 jobs in total**, with £2.3m in economic value (real, discounted). This is larger than in the 'core' analysis though external investment events are still the primary driver of benefits.

For ETP, the real, discounted and additionality-adjusted **benefit of ETP to date has been at least £1.9m**. While low, this reflects a point in time where many projects are still in progress and products have not yet reached market, or major investment secured.

However, **the picture changes if forecasts are included, with the benefit rising to £40m** (including some optimism-bias adjustment) in real, discounted terms. A lesson from the Pilot analysis is that large external investment events (and the extent to which they are attributable to UK Space Agency funding) can be the primary driver of long-run benefits. The current low numbers reflects that we have no evidence of significant, attributable events yet. It also reflects evidence gaps, with 37% of ETP organisations not responding to the survey.

We will revisit this analysis in the final evaluation, where we will provide updated estimates of monetisable benefit of the Pilot and ETP, as well as the NPSV and NPSV/DEL associated with each programme.

Again, the implication from our analysis in this interim economic evaluation is that – unsurprisingly - **continuing to track the benefits arising from the Pilot and ETP over the coming years will be crucial in assessing the extent to which the programmes have offered value for money**. At present, it is too soon to draw conclusions. The final evaluation will revisit and extent our analysis.

The final cross-cutting impact evaluation question is:

- *What lessons can be learned from the impacts of NSIP (e.g. types of impacts, magnitude, timing etc.)?*

Lessons learned will be assessed in more depth in the final evaluation, as it is difficult to draw firm conclusions when projects are still running. The separately delivered Process Evaluation discusses lessons from a programme design and delivery perspective. Our initial reflections include that:

1. **The question of 'what comes next' is key** – with the focus of Pilot/ETP typically on low-TRL projects many teams noted that further public investment is needed before they reach market and/or seek private investment. Without a clear funding vehicle at Pilot/ETP project close, many ideas risk 'sitting on the shelf' and failing to progress to meaningful impact.
2. **Spillover benefits can be substantial and should not be seen as 'ancillary' benefits** – arguably the largest driver of the economic evaluation was a partially Pilot-attributable investment in a project that was unsuccessful in its core aims and has gone down a non-space direction. Project 'failure' can still lead to sizeable impacts elsewhere, as knowledge builds on knowledge.
3. **Large investment events are the primary driver of benefits** (at least at this stage) – any UK Space Agency efforts to facilitate investment by (say) joining up project teams with accelerator programmes or investor communities has the potential to lead to sizeable benefits if it can catalyse investment that may not otherwise happen and avoid 'siloed' programmes.
4. **A small number of 'big wins' typically drive benefits** – not every project has succeeded or will succeed, nor should they be expected to. Appropriate appetite for risk and failure is needed to ensure that the 'fertile ground' for these big wins is created. Furthermore, the nature of a given call affects who gets funded (industry/academia) and so affects impact.
5. **Understanding impact relies on good data, which is difficult to retrofit** – our evaluation has been hampered by a lack of data, particularly for NSIP Pilot. We may never know many of the benefits which arose/will arise from the Pilot. This reflects time passed since projects' start but also changes in reporting requirements. Ensuring M&E frameworks are built in from the beginning is essential to understand impact. Given the long-term nature of impact pathways, processes to monitor impacts over 5-10 years are also crucial.

Finally, while not an explicit impact evaluation question, some interesting insights can be gained from looking at the distribution of funding. The programmes both show **strong alignment with UN Sustainable Development Goals related to innovation, collaboration and economic growth**, and are often focused on **space sustainability** (ETP) and **climate change** (Pilot). In terms of regional breakdown (not a scoring criterion) we see **concentration of projects and funding in the South East and in Scotland**. This is true across both strands, though ETP funding is to some extent more spread out than the Pilot. Some regions or Devolved Administrations have received relatively little funding, with Northern Ireland in particular having no funded organisations.

... now you **know.**