UK Space Agency International Partnerships Programme

Endline Evaluation Case Study

Lead Authors:

Elise Montano, Caribou Space

Diogo Silva, Caribou Space

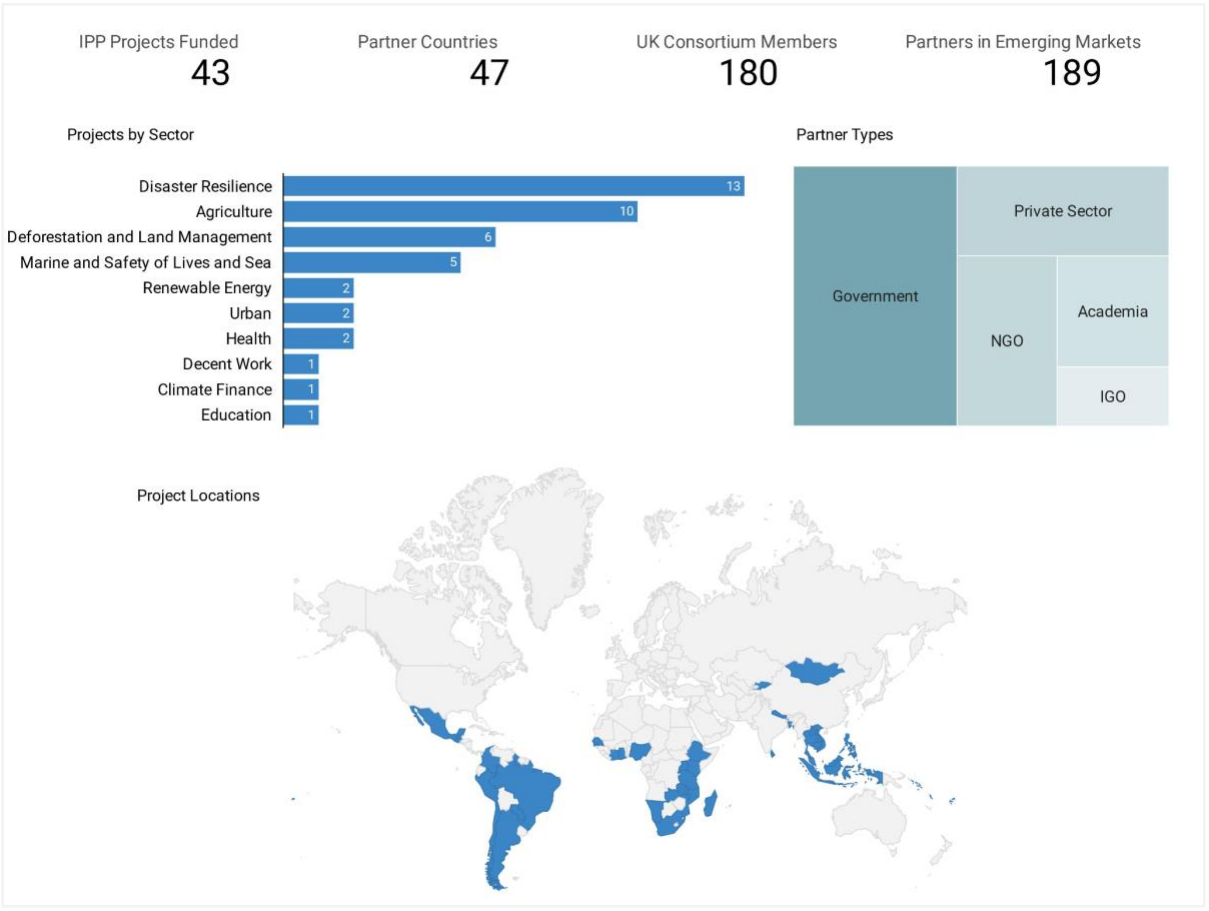
June 2022

Introduction 2
Impacts on Climate Mitigation and Adaptation 6
Disaster Resilience (SDG1: No Poverty) 6
Climate Smart Agriculture (SDG2: Zero Hunger) 7
Renewable Energy and Climate Financing (SDG7: Affordable and Clean Energy) (SDG13: Climate Action) 8
Deforestation and Land Management (SDG15: Life on Land) 9
Other Key Impacts on Development Challenges 10
Health (SDG3: Good Health and Well-being) 10
Education (SDG4: Quality Education) 10
Maritime (SDG8: Decent Work and Economic Growth) 11
Maritime (SDG14: Life Below Water) 11
Urban, Infrastructure and Industry (SDG17: Partnership for Development) 12
IPP's Sustained Impacts 12
IPP's Outcomes 12
Capacity Building 13
Lessons learned about impacts 13
Impacts on UK SMEs and Space Sector 14
IPP showed effectiveness, learned and adapted 15
Projects were relevant and coherent 15
IPP was a good use of resources 16
Conclusions 17

Introduction

The International Partnership Programme (IPP)[1] was a six year programme run by the UK Space Agency. IPP used the UK space sector's research and innovation strengths to deliver a sustainable, economic or societal benefit to emerging markets. It sought to address the need for "better access to high quality information for addressing global sustainable development challenges… [as] the lack of timely, accurate, large scale data, and reliable communications infrastructure - especially in emerging markets - results in inaction, or investments that do not deliver value for money where limited financial resources are available."[2]

Figure 1: IPP Programme Overview



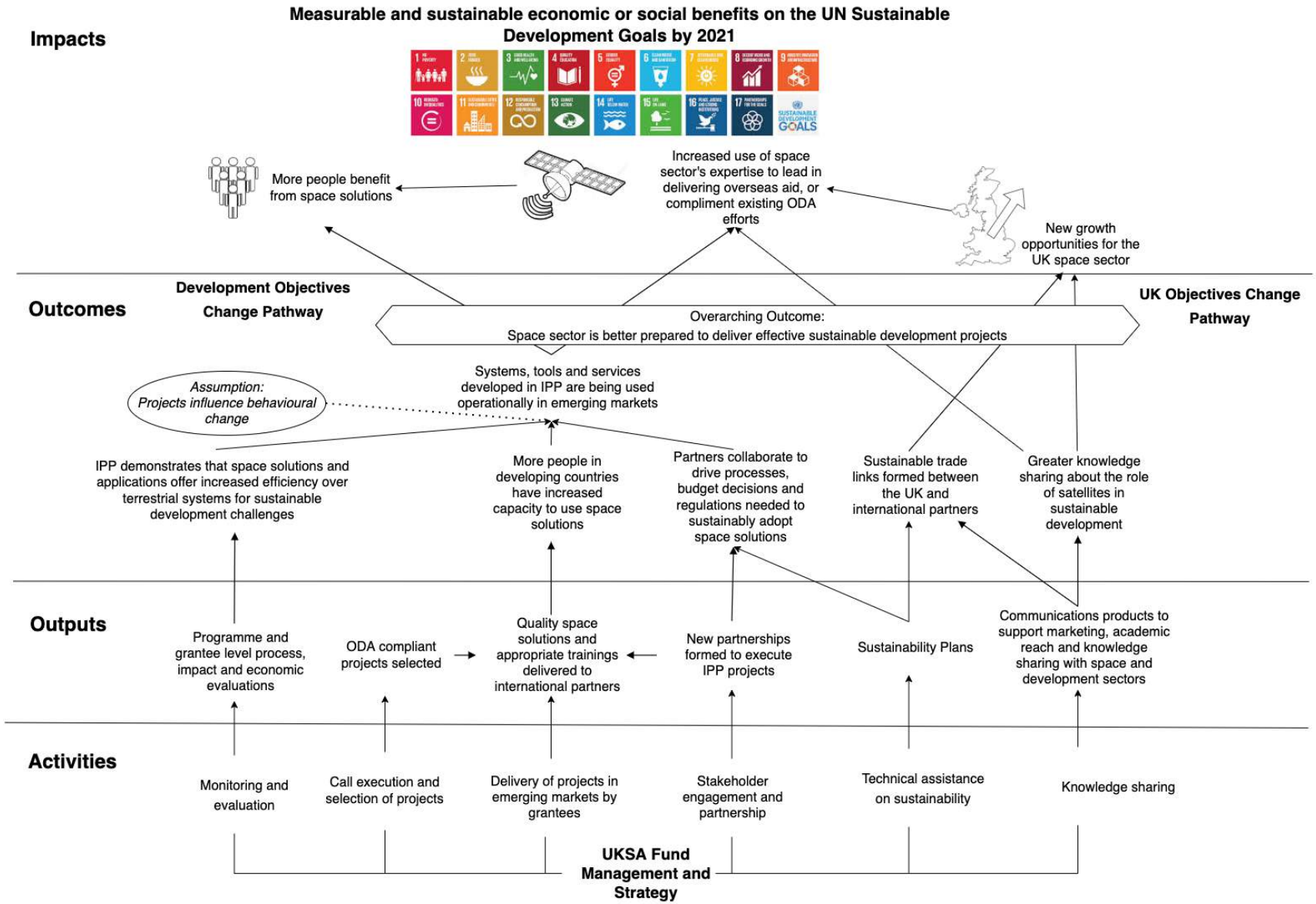
IPP's ultimate objective was to have a measurable and sustainable economic or social impact on the UN Sustainable Development Goals (SDGs) by 2022, as elaborated in the IPP Theory of Change (Figure 2). More recently, IPP increased its focus on climate change adaptation and mitigation in response to the significant potential of satellite applications to address these challenges. Overall, **IPP has contributed an important narrative and source of information on how projects can use satellite information to address a broad range of challenges.**

IPP has also stimulated over 300 growth opportunities[3] for the UK satellite sector - encouraging further export opportunities for nearly half of firms involved, and giving substantial

[1] UK Space Agency. 'International Partnership Programme'. https://www.gov.uk/government/collections/international-partnership-programme. Accessed September 2021.
[2] IPP Theory of Change
[3] Opportunities defined as new contracts, proposals, advanced discussions, trials or spin/buy outs.

experience for the sector in working in ODA contexts. It significantly advanced the capabilities and reputation of UK SMEs in the space for development sector.

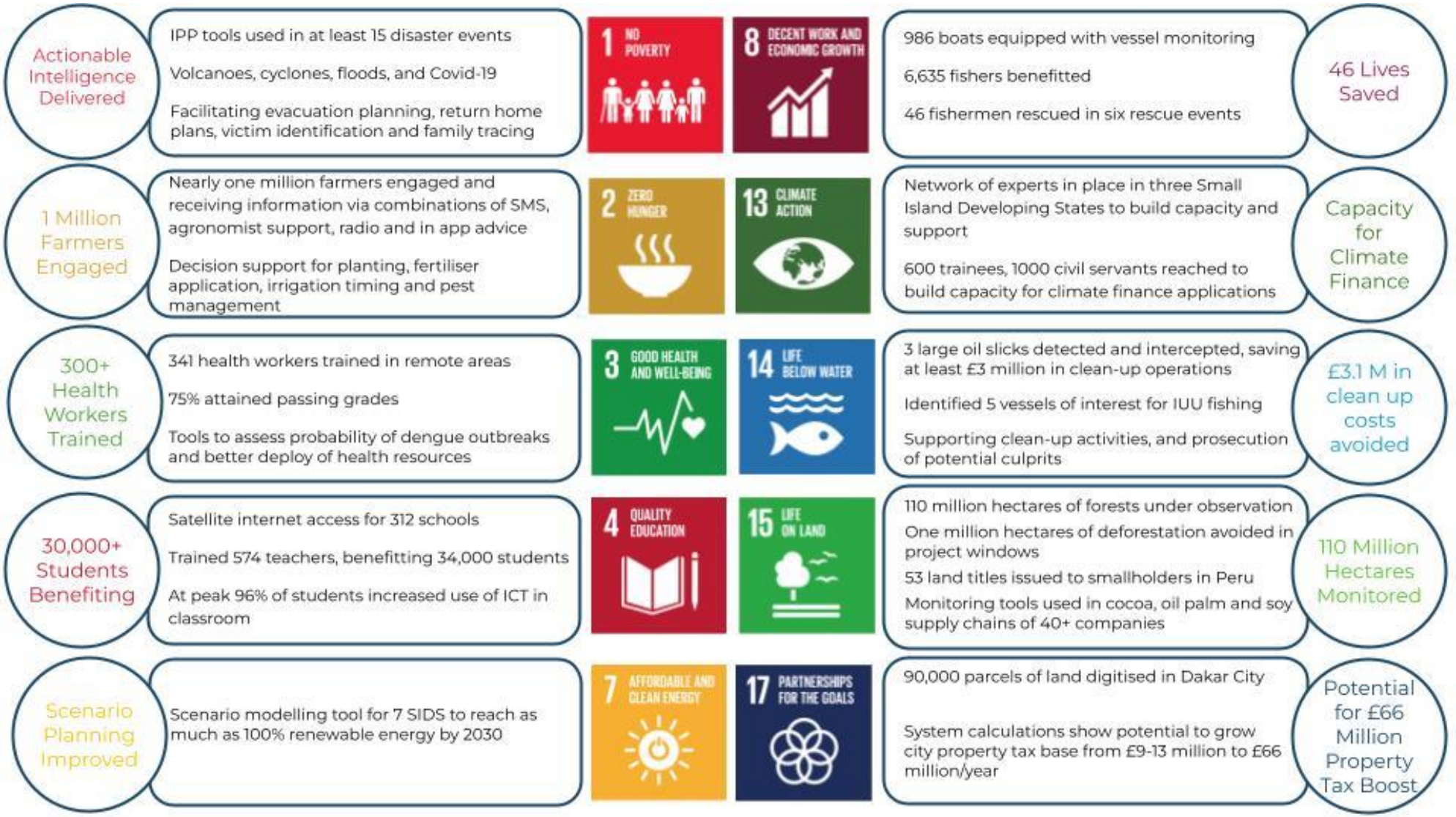
Figure 2: IPP Theory of Change



Around the world, decision makers in governments, NGOs, and private sector require better access to high quality information for addressing global sustainable development challenges. However, data-scarcity remains a barrier; the lack of timely, accurate, large scale data, and reliable communications infrastructure - especially in developing countries - results in inaction, or investments that do not deliver value for money where limited financial resources are available.

Satellite-enabled data services are uniquely poised to provide this type of information and communications infrastructure to improve decision making and connect remote, hard to reach areas. In this way, they can support more cost-effective planning and deployment of resources in developing countries.

Figure 3: Overview of IPP Outcomes and Impacts



Impacts on Climate Mitigation and Adaptation

Disaster Resilience (SDG1: No Poverty)

IPP solutions have been applied to over 15 natural disaster situations[4] where they have helped disaster management authorities to make better, faster, more resource efficient decisions - all of which can directly impact on saving lives and recovery costs. **Across nine countries, IPP project solutions have been used by government partners to prepare for, manage and respond to natural disasters caused or exacerbated by climate change**.

In Malaysia, the EASOS Flood Watch system was used during the 2017-2018 flood season to create a street by street plan for clean-up, inspection and repair of key infrastructure, returning evacuated citizens home safely and security against looting.

In the Philippines satellite communications (SatComms) tools have been used in a diverse range of humanitarian situations to connect populations cut off from terrestrial communications post-disaster. After Typhoon Vamco (local name Ulysses), the Inmarsat terminal was the first to establish communications between the local responder units and the national disaster office in Manila.

Technical backstopping combined with training from CommonSensing in Fiji, Vanuatu and Solomon Islands has led disaster management officials in Solomon Islands to rely "on the project to help develop maps for operational planning…[Teams used geospatial] products' information as a baseline for their planning of anticipated possible responses."[5]

In Peru, remote measuring displacements of tailing dams by DAMSAT has reduced the risk of dam failures and pollution incidents - preventing potential disaster instances. The project estimated through consequence modelling[6], that when the system is in place and within the monitored areas in Peru, there was a 34% reduction in the likelihood of the annual loss of life and injuries due to dam failure compared to the counterfactual.[7]

In Mongolia, herders have benefited from SIBELIUS information products hosted on regional Facebook pages, and a majority of herders surveyed cited these EO products as a source of information they use for decision making. They have also reported improved resilience and ability to cope with weather related shocks since the project began.[8]

In Nepal, METEOR data has been used to develop an existing early warning system into a multi-hazard early warning system, to support 10 local municipalities to design new Disaster Risk Reduction Management policies.

Finally, in Tanzania, METEOR data has also been used to provide early warning information, situation reports and post disaster needs assessment relating to flooding throughout 2021, and in the preparation of a new five-year Disaster Risk Reduction Strategy nationally.[9]

[4] 15 disaster situations were documented across projects in evaluations, however it is likely that there have been multiple additional cases where IPP solutions have been used that were not formally reported back to UKSA.
[5] UNITAR. '2020 Results Report.' July 2021.
[6] A model created to assess change in the probability of dam failure based on current industry practices, while applying established methods to estimate the loss of life in downstream communities. The combination of these two values, the probability and the consequences, provides an indication of how the risk in the downstream communities may change with the implementation of the project.
[7] Oxford Policy Management. 'DAMSAT Endline Evaluation Study 2021 report'. March 2021.
[8] eOsphere. 'Sibelius Endline Evaluation Report Version 2.0.' November 2021.
[9] Oxford Policy Management. 'METEOR Legacy Evaluation Report. Report Number M2.X' March 2022.

Climate Smart Agriculture (SDG2: Zero Hunger)

I**PP projects have rolled out decision support tools and satellite enabled advisory services to nearly one million smallholder farmers globally**.[10] [11] [12] Solutions developed provide farmers with access to advice and information for crop management that is targeted to new and changing conditions due to climate change. They have also enabled sharing of climate smart agricultural practices, supporting efforts to mitigate the effects of climate change.

A 'difference in differences' analysis of farmers from Kenya, Ghana and Zambia from baseline (2017) to endline (2021) shows that PRISE had a net positive effect on all three of the main crops studied when compared to control groups over time. **Maize and bean farmers saw a respective 11% and 8% increase in their production compared to control groups, and although tomato farmers had net losses, PRISE** farmers had substantially less crop loss (a difference of 60%) than control farmers.[13]

In Rwanda, a subset of 430 ACCORD farmers (out of a total 50,000 farmers) who were among the group that received messages for the longest time (from November 2018), showed up to 250% yield increases compared to baseline.[14] Across the entire 50,000 smallholder coffee farmers who received SMS messages in Kenya and Rwanda with agronomic advice tailored to weather and climate, 90% reported positive feedback about the service, and while self-reported results indicate that farmers' yields have increased, cooperative data is less certain.

Working with larger agro-exporters, EO4cultivar brought over 41,000 hectares of agricultural land in Peru and Paraguay under more sustainable land management practices - and demonstrated that while impact on yields is variable, in some crops EO derived information can contribute to an increase in yields of greater than 10%.[15] Eight agro export organisations have made changes in their decision making processes and are now consistently using IPP funded data in their routines.

[10] Earth-i. 'ACCORD Monthly Update Project Report.' November 2019.
[11] Rezatec. 'IPP Mexican COMPASS: Midline Evaluation Report.' 13 February 2019.
[12] CABI. 'PRISE Logframe FINAL-QPMSept2021'. September 2021.
[13] CABI. 'PRISE_baseline v endline data update_CD.' February 2022.
[14] Oxford Policy Management. 'ACCORD Endline Evaluation Report'. April 2021.
[15] Wavehill. 'EO4cultivar: End-line Evaluation Report.' May 2021.

Renewable Energy and Climate Financing (SDG7: Affordable and Clean Energy) (SDG13: Climate Action)

IPP funded solutions are filling an information gap in 10 Small Island Developing States (SIDS), helping to unlock future financing to transition to low carbon economies by providing high quality information about potential investments.

The RE-SAT platform is supporting decision making, and modelling to reach RE targets ranging from 15-100%.[16] [17] In Palau, St. Lucia, Vanuatu, Tonga and Mauritius, it is being used to validate specific proposals from energy producers to assess value for money and potential feasibility.[18] [19] [20] [21] It is expected in all cases to be used as an evidence base to attract future investment and leverage funding for new RE infrastructure.

In Fiji, Vanuatu and Solomon Islands, over 600 people have been trained on the use of the CommonSensing platform for climate resilience. Climate Finance Advisors hired to support the project are still in very early stages of utilising the tools to support climate finance related capacity building. However, the Climate Advisors have reached over 1000 civil servants across the three islands. Securing climate finance is a long-term endeavour, however experience of IPP project partners has shown that a US$2 million investment in activities like those delivered by CommonSensing, over a 4 year period can result in a return of nearly $44 million in realised climate finance.[22]

[16] Arkell, A and Noguer, M. 'Endline Evaluation Report: RE-SAT Montserrat.' October 2021.
[17] Arkell, A and Noguer, M. 'Endline Evaluation Report: RE-SAT Tonga.' November 2021.
[18] Arkell, A and Noguer, M. 'Endline Evaluation Report: RE-SAT Mauritius.' November 2021.
[19] Arkell, A and Noguer, M. 'Endline Evaluation Report: RE-SAT Saint Lucia.' November 2021.
[20] Arkell, A and Noguer, M. 'Endline Evaluation Report: RE-SAT Tonga.' November 2021.
[21] Arkell, A and Noguer, M. 'Endline Evaluation Report: RE-SAT Vanuatu.' December 2021.
[22] UNOSAT. 'IPP CommonSensing - WP740 Sustainability Roadmap V.08' February 2022.

Deforestation and Land Management (SDG15: Life on Land)

IPP **projects on forestry and land management** are providing solutions to support improved forest governance. Over 110 million hectares of forests are being monitored using IPP-funded EO solutions (roughly equating to the area of Ethiopia). Projects claim a total estimated area of approximately one million hectares (the size of Lebanon) of deforestation has been avoided - in the windows monitored by IPP projects over the course of those project, some of which can be linked to contributions from IPP projects.[23] [24] [25]

Country	**Hectares Monitored in IPP Projects**	**Cumulative Hectares of Avoided Deforestation** in project Observation Windows from 2017 - 2021[26] [27] [28]
Indonesia	28.8 million	710,000
Mexico	15 million	162,800
Colombia	60 million	1,870
Côte d'Ivoire	3 million	36,000
Peru	2.8 million	14,000
Brazil	3 million	145,000
Kenya	300,000	11,670
Ghana	77,000	760
Belize	155	-1.64

In Indonesia, Colombia, Belize, Kenya, and the Côte d'Ivoire alerts generated by Forest 2020 and IMAGES are used by law enforcement and forest ranger teams in the field to support tackling of illegal logging and other illegal activities.

In the Côte d'Ivoire, the IMAGES system has more than 50 stakeholders regularly using the solution,[29] including 35 cocoa companies that have committed via the Cocoa and Forest Initiative, to using the solution to monitor deforestation and ensure their cocoa supply chains are deforestation free.[30]

In Peru a large driver of deforestation is landlessness and small farmers who cut down areas of forest illegally to farm. The regional government of San Martin has also now issued 53

[23] Vivid Economics. 'Legacy Report for Deforestation prevention with land use monitoring and valuation in Cote d'Ivoire.' December 2021.
[24] Vivid Economics. 'Legacy report for 'Remote mapping and socioeconomic valuation tools to support planning and implementation in Peru.' November 2020.
[25] Ecometrica. 'Forests 2020: Logframe Version 85.' March 2021.
[26] Ecometrica. 'Forests 2020 Endline Evaluation Synthesis Report'. March 2021.
[27] Vivid Economics. 'Legacy report for 'Remote mapping and socioeconomic valuation tools to support planning and implementation in Peru.' November 2020.
[28] Vivid Economics. Legacy Report for Deforestation prevention with land use monitoring and valuation in Cote d'Ivoire.' December 2021.
[29] Vivid Economics. 'Endline Report for Deforestation prevention with land use monitoring and valuation in Cote d'Ivoire.' March 2021.
[30] Vivid Economics. Legacy Report for Deforestation prevention with land use monitoring and valuation in Cote d'Ivoire.' December 2021.

conditional land titles to smallholders to provide them with their own land to farm and intend to use the tool to issue thousands more in the future.[31]

In Colombia, the early warning system from Forest 2020 generates weekly alerts with more than 90% accuracy which law enforcement teams use to assist on the ground protection of forests. The Forest Alerts system in Kenya has similarly been adopted by the Kenya Forest Service to support the work of rangers in the field.

Globally, over 250,000 farms across cocoa, oil-palm and soy supply chains are monitored by commodity traders for compliance with zero-deforestation commodity regulations. This enables traders to identify environmental impacts and risks and implement sustainable sourcing practices.[32]

Other Key Impacts on Development Challenges

Health (SDG3: Good Health and Well-being)

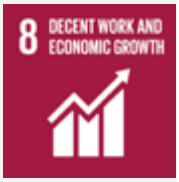
IPP has funded several projects that support health professionals to make better and faster decisions in their work. This includes a project that enables dengue risk forecasts on a monthly basis, **enabling officials in VietNam to take preventative decisions up to six months earlier than was possible with traditional, manual risk assessments**.[33] IPP also funded e-health solutions through SatComms technology that managed to deliver video training for 341 health workers in remote areas. As a result, 246 (or 75%) of these have attained at least a 60% pass rate.[34]

Education (SDG4: Quality Education)

Satellite data has been used by iKnowledge to improve educational outcomes in Tanzania, by providing 312 schools with satellite internet access - reaching an estimated 34,000 students. 574 teachers were trained in the use of ICT for educational objectives and at the endline evaluation, initially 96% of their students reported that they saw an increased use of ICT in their classrooms.[35]

[31] Vivid Economics. 'Legacy report for 'Remote mapping and socioeconomic valuation tools to support planning and implementation in Peru.' November 2020.
[32] Ecometrica. 'Forests 2020 Endline Evaluation Synthesis Report'. March 2021.
[33] Oxford Policy Management. 'D-MOSS Midline Evaluation Report'. December 2020.
[34] Inmarsat Nigeria. Ebenso B. and Allsop M. 'Report of Legacy Assessment for Extending Nigerian Health Services to Rural Populations using Satcoms to Strengthen Health Systems and Improve Health Outcomes'. June 2020.
[35] Ace Africa. 'iKnowledge (Tanzania): End line Monitoring and Evaluation Report for Phase 1 and Phase 2 Schools.' Avanti Communications Ltd. October 2018.

Maritime (SDG8: Decent Work and Economic Growth)



IPP-funded equipment had been used in six rescue missions which saved a total of 46 fishermen.[36] [37] This includes two rescue missions in South Africa in 2019 covering seven fishers equipped with OASIS-TU identifiers, and four rescues in Indonesia affecting a total of 39 crew equipped with Inmarsat SatComms equipment. This is based on nearly 1,000 small fishing boats that have been equipped with vessel tracking devices.[38] [39]

Maritime (SDG14: Life Below Water)

IPP funded solutions have enabled real time monitoring that helped to identify at least five vessels suspected of IUU activities, saved an estimated total £3.1 million in saved clean up coast from oil spills and helped improve fisher incomes by two to six percent.

The Philippine Bureau of Fisheries and Aquatic Resources (BFAR) gained access to Verumar EO information to analyse vessel information and identify at least five vessels for detaining and/or issuing fines as a direct result of reports created by the system. Reports flag vessels that display suspicious activity allowing BFAR to create a 'vessels of interest list'. Ad-hoc requests for track analysis of vessels of interest to BFAR were requested to support investigations into IUU activities i.e. fishing, poaching, and trafficking.[40]

In Malaysia, EASOS Marine Watch has been instrumental in mitigating the effects of three maritime accidents. It has detected two oil slicks before they reached land, resulting in an estimated total of £3.1 million in saved clean-up costs across both incidents. It has also been used to model the historic movement of an oil slick that did make landfall, to identify potential culprits and support their prosecution.[41] [42]

In Indonesia, Inmarsat SatComms for fishing reporting revealed other significant benefits: overall, fishers equipped with vessel monitoring showed an average two to six percent increase in their income (compared to control groups), and used 32% less fuel than the control boats.[43]

In Madagascar, C-RISe work to build the service capabilities of organisations that respond to coastal hazards, and manage marine resources; for example bringing new areas of sea under marine protected area schemes, including new parameters in tidal forecasts, and use of C-RISe data in the Madagascar Coastal and Marine Atlas and in the development of a new Marine Spatial Plan.

[36] ExactEarth Europe. 'Midline Project Evaluation.' November 2018.
[37] Poseidon. 'Inmarsat Indonesia Endline Impact Assessment.' September 2019.
[38] ExactEarth Europe. 'sOuth Africa Safety Initiative for Small vessels operational Take-Up (OASIS -TU) Final Report.' 29 March 2019.
[39] Poseidon. 'Inmarsat Indonesia Endline Impact Assessment.' September 2019.
[40] Poseidon. 'VERUMAR Endline Evaluation Report'. March 2021
[41] LTS International, 'EASOS: Initial Evaluation.' May 2019
[42] EASOS, 'Oil Spill Impact Analysis.' June 2019.
[43] Poseidon. 'Inmarsat Indonesia Endline Impact Assessment.' September 2019.

Urban, Infrastructure and Industry (SDG17: Partnership for Development)

The Property Database for Dakar digitised over 90,000 parcels of land and found that, if implemented, property tax collection could grow from the approximately £10 million actually collected to a potential £66 million per year.[44] [45] Furthermore, it showed that maintaining the database would identify changes in 5-10% of properties annually further growing the city's potential tax base.

IPP's Sustained Impacts

91% of international partners surveyed believe that some or all benefits from the grantee run projects they were involved in have been sustained to some degree. These benefits include continued use of the datasets, products and solutions created with IPP funding, but also extend further to soft benefits like the methodologies, and techniques created, broader knowledge and capacity and benefits associated with raising the demand for satellite data.

More than 80% of IPP projects have expanded, adapted and/or grown their scope in some way during (or since) grant funding. This included funding to ingest new datasets/types, to expand to new regions or countries, or explore new sectors. Most of these projects were easily transferable because the data at the centre of them is scalable. Datacubes in particular bring inherent additional value for long term expansion/ adaptation as they capture data over a long time scale and large area that can be applied to many different concepts outside of the boundaries of a single project.

40% of project solutions have been handed over to end users for ongoing use and/or have been adopted by end users under a commercial agreement. Four areas of sustainability planning were challenging: understanding of markets and customers, challenging sales environments, business planning capabilities and business operations capabilities. After technical support via the IPP Sustainability Hub, at endline 13 projects were piloted, 11 were adopted by end users (to different extents) and three saw wider adoption by additional partners and/or in additional contexts.

Through the sustainability hub process, five core lessons for greater sustainability were identified:

1. Greater scrutiny of proposals is needed to assess potential for sustainability;
2. Grantee projects need to strike a balance between 'simple' and 'innovative' products;
3. Grantee projects need an adequate in-country presence;
4. Earlier and deeper engagement is needed to support grantees to develop sustainability plans;
5. Where grantees engage formally with their wider consortium and international partners it is a benefit to sustainability.

IPP's Outcomes

IPP's 43 grantee projects created 60 bespoke solutions with international partners. Many of these solutions developed new and innovative processes, algorithms, and abilities that had never before been applied to the specific development challenges they were

[44] €76m according to original calculations.
[45] Airbus Defence & Space. 'Satellite Image Analysis for Operational Maintenance of a Property Database for Dakar City, Senegal: M&E Endline Evaluation Report Version 1.0.' January 2019.

addressing. Beyond these technical achievements, IPP's most tangible achievements to date can be grouped into three main outcome areas:

(1) **Information for Decision Making:** Bespoke solutions (data, solutions and products) that enable improved decision making for international partners.
(2) **Capacity Development:** to enable partners to make use of data and solutions.
(3) **Partnerships, Collaboration and Diplomacy:** Forging new partnerships and collaborations for project delivery.

IPP projects have shown that when combined with appropriate capacity development and policy change, satellite data provides essential information - evidence - for decision making. It has enabled decision making that is:

- **More timely**, **near real time data provided by IPP projects supports faster and more relevant interventions.** Often this enables forward planning, and preventative action, rather than only reactive actions to be taken, for example to intervene earlier when deforestation is anticipated, or to provide targeted public health information. International partners, when surveyed, confirmed that **having access to data that is timely and relevant facilitates their decision making processes and decreases the time and costs spent on decision making.**
- **More accurate**, better decisions can be made as they are grounded in independent data, rather than estimates based on past experience. This enables decision makers to be more confident in their decisions and deploy resources more effectively.
- Together, these conditions can help make resource managers **more accountable** for their actions. Because there is real-time, accurate information, farmers, forest managers, and energy providers can be held to account for what happens to the resources they manage.

Capacity Building

Capacity building is part of what made IPP unique in the space for the development sector. It was a key feature of how most IPP projects ensured long-term sustainability and that end users are able to integrate the data provided into existing systems and policies.

In total, **almost 7,200 individuals have benefited from capacity development activities conducted by IPP projects. This includes approximately 4,800 men and 2,400 women.** When these efforts were assessed, projects found overwhelming evidence that participants (often >85%) that training and technical support provided was relevant, useful and likely to be implemented in the future. 79% of international partners reported applying the knowledge, expertise or new contacts gained through IPP to other work.

Projects built partnerships with at least 24 research institutions and universities in 15 emerging markets. IPP has also funded international students, six PhDs (three female, three male), and 14 MSc (all male) students. A further 10 undergraduate students (genders unknown) have been involved in unfunded positions in projects.

Partnerships, network building and international collaboration have also been one of the critical success points of IPP. IPP opened partnership lines between the UK space sector and emerging markets where none existed before and has helped to improve international partners' status and networks locally and globally. In several cases, international partners are increasingly being called on by ministries and government agencies to act as sources of information and expertise.

Lessons learned about impacts

Common factors that are believed to be significant determinants of project success based on analysis of all projects include:

- A high degree of relevance for/demand from end users. IPP was most successful when end users believed in the solution (because they were intimately involved in designing it) and had a pressing need for it.
- Having direct engagement of end users as partners, rather than via an intermediary (who was a partner).
- High quality and appropriate capacity building activities that enabled end users to use (and possibly maintain) solutions independently.

At times, grantee projects struggled with moving intended users from the point of delivering capacity, to actual 'use' of that satellite enabled information. Barriers that led to this breakdown included:

- Inadequate project design and scoping by consortia (including knowledge of context)
- Insufficient trust between end users and the consortium designing the solution due to new (or weak) relationships
- Insufficient time to demonstrate and realise results
- Insufficient capacity building and engagement planning by grantees for the type of handover planned
- Inability to consistently engage end users over multiple years
- Complexity and competing interests among end users
- High cost of the final solution

Some of these barriers can be addressed through grantee project design, however, it is important to acknowledge that in many cases projects attempted to tackle complex issues that were not always solvable by IPP projects (e.g. political context, economic context and prevailing market forces). **It was often beyond the ability of IPP grantees to address all these enabling factors, however they had a significant impact on the effectiveness of projects**.

Impacts on UK SMEs and Space Sector

In 2019 (updated in 2021/22), London Economics carried out an assessment to quantify the expected economic benefits of IPP on UK grant recipients, their supply chains and the wider UK economy. The assessment only considered the benefits that accrue to the UK via grant recipients. A large proportion of benefits from IPP are associated with the socio-economic value generated by IPP projects within developing countries. These impacts, likely to be large in nature, were not considered in the assessment, and are instead presented as part of a separate cost-effectiveness report. **The assessment found that, considering both public and private investments, the IPP's total economic return to the UK was found to be an additional benefit of £0.60 per £1 of public investment,** and t**he total present value (PV) of additional benefits of IPP to the UK economy is estimated at £200m.**[46] [47]

In addition, IPP is also projected to support employment of over 3,300 FTEs that would not have existed without the programme. This includes over 900 UK-based FTEs directly supported by the grants, and a further 2,400 in the wider supply chain.

Considering only public investment, the return to HMG was an additional £1.97 per £1 of public investment.

[46] London Economics. "Economic Evaluation of IPP: Economic Return to the UK: Issue 2" March 2022.

[47] This finding was also confirmed by Itad Ltd in a survey of IPP consortium members. 42% reported agreeing or strongly agreeing that IPP projects had contributed to new or significantly improved commercial products and/or services, job creation, business and spin off companies. 32% of respondents were neutral when asked this question and only 10% responded negatively (14% responded don't know or N/A).

Just under half (47%) of consortium members have reported that IPP had led to new follow-on opportunities for their organisation.[48] Most of these opportunities continue to be in emerging markets. To date, IPP has helped companies to secure just over £46 million in IPP attributable sales.

Involvement in IPP helped to derisk technical development and allowed grantees to have operational experience to take a product to market.

Companies have also reported additional (non-financial) benefits to their businesses, including improving their exports/offer, their commercial partnerships, workforce capabilities, knowledge of M&E and ODA, and contributing to a generally raised profile globally. They highlighted the reputational benefits of being associated with the UK Space Agency as being key to their growth and position in the sector (within the UK and abroad). In several cases, having an 'endorsement' from the UK government was seen as a key enabler for accessing partner government ministries and 'higher circles' of officials.

IPP showed effectiveness, learned and adapted

IPP has achieved many of its objectives and generated evidence that satellite data, combined with capacity building, and partnerships can address challenges associated with climate change and the UN SDGs.

Partnerships were routinely highlighted as one of the most effective elements of IPP. **100% of international partners surveyed responded positively (at least a 5 out of 10 score) when asked about their experience as an IPP partner.** UK consortium members felt that by and large international partners contributed to projects at (or above) the levels they had committed to during the proposal phase. Partners contributed data, staff time and expertise to the projects as well as softer elements (like their network, and knowledge of local resources) that were often indispensable.

IPP implemented a comprehensive and rigorous system for monitoring and evaluation across all levels of the programme. 50 consortia members were trained on M&E approaches via Caribou Space, and organisations delivered over 165 evaluations of their projects. IPP has helped evolve how companies plan for and report on outcomes and impacts they have achieved beyond technology development. While there is still room for the sector to further specialise in M&E, IPP has been a significant contributor to progress. Recommendations to consider for future programmes, include a more agile (and slimmed down) M&E approach, clear centrally defined objectives with a shared vision on the sufficiency of impact across all areas to guide M&E and potentially a central database of monitoring and evaluation results that can provide the ability to generate flexible queries at different levels (e.g. impact/outcome levels, project level, programme level).

Grantee projects were relevant and coherent

Over 90% of partners reported either a 4 or 5 out of 5 when asked to rank how relevant the project was to their needs. Individual projects were compatible with national and international priorities, and at times complemented other UK government funded initiatives, for example BEIS led work on International Climate Finance.

[48] This finding was also confirmed by Itad in a survey of IPP consortium members. 42% reported agreeing or strongly agreeing that IPP projects had contributed to new or significantly improved commercial products and/or services, job creation, businesses and spin off companies. 32% of respondents were neutral when asked this question and only 10% responded negatively (14% responded don't know or N/A).

The FCDO has a role to ensure and promote coherence across government funded work, and to help anticipate problems in partner countries.

As the programme developed, UKSA focused a lot of effort into the interaction and cooperation with FCDO country staff which significantly increased the interaction and the support provided in country; this was very beneficial and greatly appreciated by the grantee projects. For any future similar programmes, it is worth noting that in a survey carried out for this endline FCDO in-country teams interviewed felt that they could add more value if they were more involved early in the call design, grantee project selection, set-up, and into major reviews and evaluations. UKSA had already planned to build this into any future IPP programme.

IPP has also played a pivotal role in the growing use of space for the development sector over the past six years. Since 2016, space technology is increasingly used to address development challenges - and is being applied to an ever growing number of use cases and challenge types. **IPP has contributed an important narrative and source of information on how projects can use satellite information to address a broad range of challenges.**

IPP was a good use of resources

According to a BEIS funded evaluation of GCRF: "GCRF faces challenges in assessing Value for Money, reflecting common issues in both development and R&I portfolios, and these can seem overwhelming; a suitable response is to focus on cost control and efficiently producing outputs."[49] However, **from the nature of satellite projects, to their design and implementation, IPP projects took steps to ensure individual projects, and the programme delivered value for money.**

In another London Economics report,[50] IPP projects were found to be cost effective in relation to non-space alternatives. The economies of scale offered by space technology have ensured that IPP projects are on track to deliver impacts more cost effectively than alternative (non-space) methods. Earth observation projects in particular can scale relatively easily. Methods can be replicated, viewing windows expanded, and adapted to allow results to be amplified at marginal additional costs (once the initial development investment has been made).

- **Forestry**: Space-enabled solutions for forestry are on average **x6 times more cost-effective** than the non-space alternatives (aerial photography, drones, patrols) in the short term (and nearly **x10** times in the longer term). In the longer term, this corresponds to an average cost of £16.46 per hectare of deforestation avoided.
- **Agriculture**: Space-enabled solutions for agriculture are on average **x5 times more cost-effective** than the non-space alternatives (drones, patrols, extension workers) in the short term (and up to **x5.8** times in the longer term). In the longer term, this corresponds to a cost of £0.01 per £1 of additional crop yield gained.
- **Disaster resilience**: Space-enabled solutions for disaster resilience are on average **x1.8 times more cost effective** than the non-space alternatives in the short term (and up to **x1.9 times** in the longer term). In the longer term, this corresponds to a cost of £34,530 per killed, missing or injured (KMI) person avoided.
- Space-enabled solutions are also more cost-effective than non-space alternatives in other development areas, such as health and wellbeing, maritime, renewable energy, connectivity, and tax collection.[51]

[49] BEIS. 'Stage 1a Review of Management Processes: Evaluation of the Global Challenges Research Fund.' Published in February 2022. Posted at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1055520/gcrf-evaluation-1a-management-review-report.pdf. Last Accessed: February 2022.

[50] London Economics. 'Economic evaluation of the International Partnership Programme (IPP) Cost-Effectiveness Analysis: Issue 2: Update to the 2019 report.' Prepared for the UK Space Agency. March 2022.

[51] London Economics. 'Economic evaluation of the International Partnership Programme (IPP) Cost-Effectiveness Analysis: Issue 2: Update to the 2019 report.' Prepared for the UK Space Agency. March 2022.

Impact of COVID-19 on the programme

The global COVID-19 pandemic, and ensuing national lockdowns, travel restrictions and economic recession had an undeniable impact on the delivery of IPP. For many projects, it took months to reorganise budgets and timelines around the new reality of remote engagement. Fortunately, most projects had already had face to face visits with end users and partners, providing some foundations to work from in an online only mode. However, the economic ramifications of the pandemic have had negative impacts on projects.

Conclusions

IPP has demonstrated the value of satellite technology for addressing a broad range of climate and development challenges. IPP has made high quality data more available and accessible for decision makers to make decisions that are more timely, evidence informed, and confident. It has facilitated significant capacity building efforts to support the use of (and demand for) this data in the medium term. Together, these outcomes show in very specific project examples how satellite data can be effectively used to address development challenges.

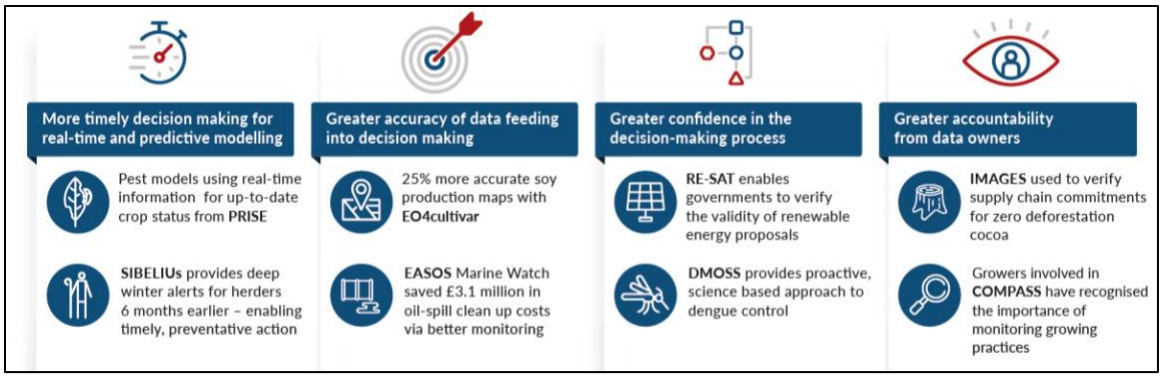
IPP has also stimulated growth opportunities for the UK satellite sector - encouraging further export opportunities for nearly half of firms involved, and giving substantial experience for the sector in working in ODA contexts. It has also significantly advanced the capabilities and reputation of UK SMEs in the space for development sector.

While the impacts and ripple effects of the programme continue to grow over time it has clearly demonstrated the value of space technology for emerging markets to date. The use of space technology for development assistance was still nascent when IPP began, but there are clear signs that interest, and use is continuing to grow. **Although satellite technology has not yet fully been mainstreamed into international development assistance practices, use is growing and IPP has contributed an important narrative and source of information on how projects can use satellite information to address a broad range of challenges.**

Modelling done by London Economics confirms the potential, hypothetical future impacts of using satellite technology for key sectors if implemented between 2022 and 2030.[52] This includes the potential to help close the agricultural yield gap, by increasing crop production values, scaling up hectares of deforestation avoided, renewable energy generated and avoidance of the negative human and economic impacts of disasters. While none of these impacts have yet been realised, they model the potential for greater application of space technology at scale.

Overview of IPP Outcomes

[52] London Economics. "Quantifying the impact of globally scaled satellite applications: A report for the UK Space Agency International Partnership Programme (IPP)." March 20222.


More timely decision making for real-time and predictive modelling
Pest models using real-time information for up-to-date crop status from PRISE
SIBELIUs provides deep winter alerts for herders 6 months earlier – enabling timely, preventative action
Greater accuracy of data feeding into decision making
25% more accurate soy production maps with EO4cultivar
EASOS Marine Watch saved £3.1 million in oil-spill clean up costs via better monitoring
Greater confidence in the decision-making process
RE-SAT enables governments to verify the validity of renewable energy proposals
DMOSS provides proactive, science based approach to dengue control
Greater accountability from data owners
IMAGES used to verify supply chain commitments for zero deforestation cocoa
Growers involved in COMPASS have recognised the importance of monitoring growing practices