Darwin Plus:
Overseas Territories Environment and Climate Fund
Annual Report

To be completed with reference to the "Writing a Darwin Report" guidance: (http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Submission Deadline: 30th April 2020

Darwin Plus Project Information

Project reference	DPLUS083
Project title	Soil map and online database as climate change mitigation tools
Territory(ies)	Falkland Islands
Lead organisation	South Atlantic Environmental Research Institute (SAERI)
Partner institutions	Centre for Ecology and Hydrology (UKCEH), Falkland Island Government (FIG), James Hutton Institute (JHI), Natural History Museum (NHM), UK Falkland Island Trust (UK FIT) and University of Magallanes (UMAG)
Grant value	£265,612
Start/end dates of project	1st April 2018 to 31st October 2020
Reporting period (e.g. Apr 2019-Mar 2020) and number (e.g. Annual Report 1, 2)	April 2019 to March 2020 AR2
Project Leader name	Tara Pelembe
Project website/blog/social media	Website: https://www.south-atlantic-research.org/research/terrestrial-science/soil-map-and-online-database-as-climate-change-mitigation-tools/ Blog: https://www.south-atlantic-research.org/news/ Twitter: @SAERI_FI Facebook: https://www.facebook.com/S4ERI/ #FalklandSoils
Report author(s) and date	Stefanie Carter (Project Manager), Jim McAdam (Project Partner), Chris Evans (Project Partner); proof-reading and supply of supporting documents by the whole Project Management Group and SAERI Senior Management Team 30 April 2020

1. Project summary

The soil mapping project aims to create a national soil map of the Falkland Islands (Figure 1). The project also aims to develop an interactive tool for local stakeholders. This tool will make data such as soil type, chemical properties, pH and bulk density available at farm level at a resolution of 30 m, which can then be utilised by farmers as well as agricultural advisors, conservation and research organisations for improved land management. In order to address challenges faced through climate change, the project also aims to establish a baseline for estimation of peat extent, carbon stock and erosion.

These deliverables will be achieved through extensive soil surveys across the Falkland Islands (Figure 1). For each location where soil was surveyed, soil was classified by a range of soil properties (such as pH, bulk density, soil moisture, electric conductivity and several chemical properties). In addition, erosion extent and peat depth were recorded. Soil health from samples at selected locations will be ascertained by analysing samples for microbiological properties.

The outcome of this project is highly relevant to local stakeholders – mainly landowners and land managers – but also conservation organisations. Stakeholder engagement and consultation are therefore a particular focus for the project as are the stakeholders' requirements for the delivery of the final interactive tool.

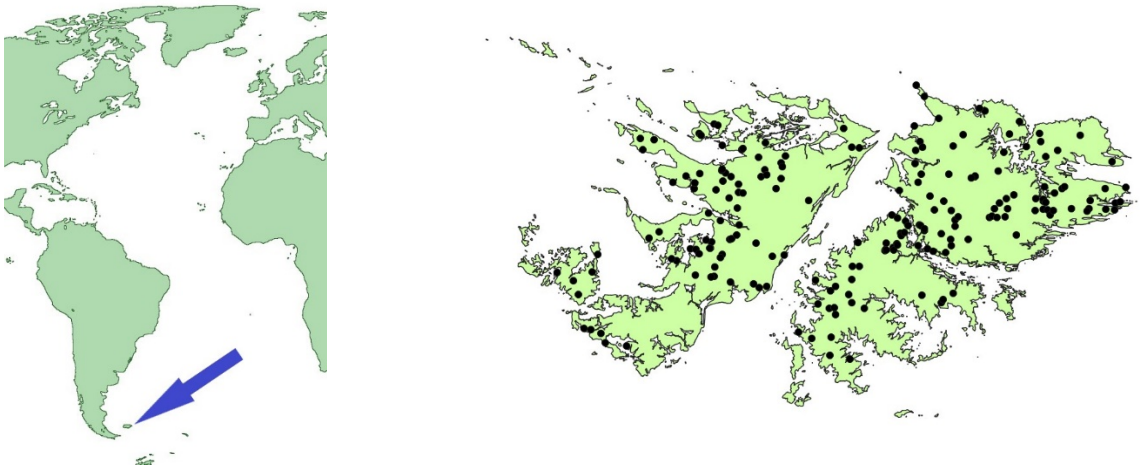


Figure 1: Location of the Falkland Islands (left). Location of soil survey points within the Falkland Islands (right).

2. Project stakeholders/partners

Project partners

The project partners form the Project Management Group (PMG) and have met regularly to guide the project, decide on the methodologies applied and discuss any issues that have arisen. They also have a Monitoring and Evaluation (M&E) function. Four PMG meetings were held in this reporting period, the notes for which are available here.

The project partners are directly involved in supporting the project as follows:

- SAERI is the lead organisation. SAERI's main office is in the host territory from which the Project Manager Stefanie Carter runs the project administration (e.g. PMG and stakeholder meetings, purchasing equipment, managing the budget), maintains contact with stakeholders, plans the fieldwork and carries out the fieldwork alongside the soil surveyor. She is supported by SAERI's Deputy Director (Innovation) Tara Pelembe and Deputy Director (Science) Alastair Baylis with the overall project management, by SAERI's Deputy Director (Business & Programmes) Teresa Bowers with project finances and by SAERI's office staff (Lee Summers, Alena-Rose Douglas) with general administration and logistics.
- Falkland Island Government (FIG) is the lead host-territory partner organisation and is involved in stakeholder engagement and soil lab analyses but has also advised on general fieldwork planning and methodology. James Bryan and Matthew McNee from the Department of Agriculture (DoA) have been involved in contacting landowners to update them on the progression of the project, for permission to carry out the soil surveys and assisted in planning and running the stakeholder workshops. Gordon Lennie (DoA) processed all soil samples collected in the field and analysed ca. 60% of them for chemical and physical properties.
- Matt Aitkenhead from the James Hutton Institute, UK, is the lead for the soil modelling. He selected the satellite maps, compiled all available environmental data, which form the

baseline of the model, selected the soil sample points, and is creating all maps. He is also carrying out the soil classification based on field descriptions and lab analyses.

- Chris Evans from UKCEH in Bangor, UK, has advised on general fieldwork methodology and planning and more particularly on recording peat and erosion extent. He has also instigated an additional deliverable to the project (soil CO_2 flux monitoring) and assisted in organising the relevant equipment and planning the experimental design. Chris also joined the fieldwork through a self-funded trip and provided a weather station on a permanent loan basis.
- Anne D. Jungblut from the Natural History Museum, UK, is the lead on soil microbiology. She visited the Falkland Islands in the beginning of 2019 to collect soil samples and is carrying out the DNA extraction and sequencing. Anne will also interpret the results on soil microbial communities and put these in a wider context.
- Jim McAdam (UK FIT) has the lead on stakeholder engagement in the project. He was involved in organising and running the stakeholder workshops and met with many farmers individually who were unable to join the workshops.
- Sergio Radic Schilling from the University of Magallanes (UMAG), Chile, has advised on fieldwork methodology, assisted with fieldwork and will advise on the interpretation of the soil properties. He also recruited the soil surveyor, Roberto Jara Langhaus, for the fieldwork.

One particular partner relationship strengthened by on-going collaboration is that between SAERI and UKCEH. A gas flux experiment initiated by the Soil Mapping Project was only made possible through close collaboration with the UKCEH project partner, who made the required equipment available in order for the PM to ship it down to the Falkland Islands. Additionally, project partner Chris Evans joined the gas flux fieldwork and soil survey fieldwork at his own expense and encouraged the PM to collaborate with his research project on water chemistry from lakes, ponds and estuaries in the Falklands (Figure 2). Furthermore, UKCEH have provided a weather station on a permanent loan basis to SAERI to initiate the gathering of long-term climatic data (Figure 3). Monthly summary data are made publicly available on the project website, whilst the raw data will be stored for future analyses. These collaborations have now led to talks between SAERI and UKCEH to pursue an MoU for future research collaborations beyond the Soil Mapping Project.

Figure 2: UKCEH project partner Chris Evans carrying out gas flux measurements (left) and Chris Evans with PhD student Stacey Felgate taking chemistry measurements from a lake in West Falkland.

Figure 3: Weather Station provided by UKCEH on permanent loan.

Project stakeholders – host territory

Stakeholder engagement is a key component of the project as the final maps and interactive tool produced by the project will directly benefit local stakeholders and stakeholders in the wider peatland community. Stakeholders who have been engaged in the project included: farmers, representatives of rural associations, FIG, Department of Agriculture (DoA) officials, Falklands Landholdings (FLH), Relevant Members of the Legislative Assembly (MLAs), NGO Falklands Conservation and Independent Research Institute SAERI, IUCN and other organisations outside the Falklands engaged in sustainable peatland management.

At the planning stage of the project, there was engagement with

a. Those involved in the previous EU-BEST project, *Potential impact of climate change on terrestrial ecosystems in the Falkland Islands*
b. FIG-DoA and Environmental Policy
c. SAERI
d. Other relevant experts, e.g. qualified soil surveyors with Falklands experience

A key component of stakeholder involvement was a general public stall at the Expo during Farmers' Week (Figure 4) run by the Project Manager (PM) on 2nd July 2019 and a presentation to ca. 25 farmers on the progress of the soil project held on 4th July 2019 (Figure 5). The presentation generated lots of interest and questions on the technical aspects of the project. The PM also demonstrated how the final maps and interactive tool will be delivered and encouraged all farmers to feedback on the suggested format.
In addition, two Stakeholder workshops (one in Stanley, East Falkland and one in Fox Bay, West Falkland) were held in February 2020. The agenda for and invitation to the stakeholder workshops was discussed and agreed with the project partners. The workshops were advertised on Falklands Radio, in the Penguin News (local newspaper), Wool Press (bi-monthly magazine for farmers) and Facebook (Figure 6). This was followed by individual farmer/landowner presentations and one-to-one discussions for those who were either not able to attend or who attended but wanted to spend more time discussing their own farm situation and the potential of the maps to help them better manage their soil resource.
Although numbers attending the East Falkland workshop were small, there was representation across all sectors and the project partner responsible for stakeholder engagement was able to follow up with three individual farm owner visits. An additional stakeholder forum was held on West Falkland to facilitate those farmers and stakeholders who might not have found it easy or convenient to travel to East Falkland. There was good attendance at this event. Please see the workshop report for details, individual presentations are available on the project website. Subsequently, the project partner responsible for stakeholder engagement visited four farmers on West Falkland who had been unable to attend the workshop. An overview of stakeholder engagement is available in Annex 3.

Figure 4: General public stall with poster presentation, soil profile activity for children and preliminary maps at Farmer's Week.

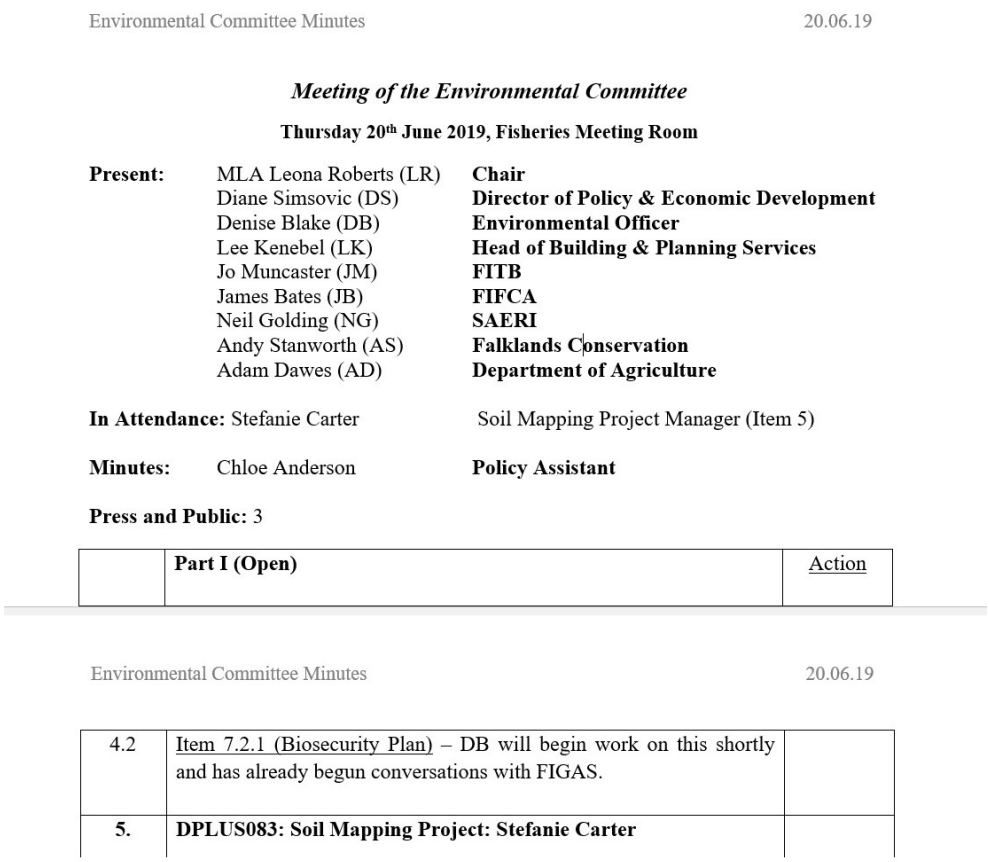
Figure 5: Presentation held at Farmers' Week.

Figure 6: Adverts for Farmer's workshops in the Penguin News (left), Wool Press (middle), Facebook (right).

The UKFIT Project Partner also met with and briefed the following people on the progress of the soil mapping project:

- FIG Director of the Department of Natural Resources, Andrea Clausen
- FIG Senior Agricultural Adviser, Department of Agriculture, Tom McIntosh
- Assistant Director and the Habitats Restoration Officer of Falklands Conservation, Andy Stanworth and Katherine Ross, respectively

The PM attended the Falkland Islands Government's (FIG) Environment Committee in June 2019 and delivered a presentation on the soil mapping project to the committee; attendees are listed in Figure 7.



Environmental Committee Minutes 20.06.19

Meeting of the Environmental Committee

Thursday 20th June 2019, Fisheries Meeting Room

Present:	MLA Leona Roberts (LR)	**Chair**
	Diane Simsovic (DS)	**Director of Policy & Economic Development**
	Denise Blake (DB)	**Environmental Officer**
	Lee Kenebel (LK)	**Head of Building & Planning Services**
	Jo Muncaster (JM)	**FITB**
	James Bates (JB)	**FIFCA**
	Neil Golding (NG)	**SAERI**
	Andy Stanworth (AS)	**Falklands Conservation**
	Adam Dawes (AD)	**Department of Agriculture**

In Attendance: Stefanie Carter Soil Mapping Project Manager (Item 5)

Minutes: Chloe Anderson **Policy Assistant**

Press and Public: 3

	Part I (Open)	Action

Environmental Committee Minutes 20.06.19

4.2	Item 7.2.1 (Biosecurity Plan) – DB will begin work on this shortly and has already begun conversations with FIGAS.	
5.	**DPLUS083: Soil Mapping Project: Stefanie Carter**	

Figure 7: FIG's Environment Committee meeting notes excerpt from 20th June 2019.

The UKFIT Project Partner also delivered a lunchtime seminar to SAERI staff on the history of land use in the Falklands, the threats posed by potential climate change and the need for and application of the soil mapping project.

Project stakeholders – global

The PM presented the project on 24 February to a delegation from the Foreign & Commonwealth Office (FCO) visiting the Falkland Islands and the PM and the UK FIT Project Partner discussed the project in further detail during a subsequent informal lunch. The following people attended: Ben Cooper (FCO Overseas Territory Directorate), Sarah Cowley (Vice Consul, British Embassy, Montevideo, Uruguay), Robin Smith (Defence Attaché, British Embassy, Buenos Aires, Argentina), Emily Hourmouzios (Head of Programs, British Embassy, Buenos Aires, Argentina), Michael Dunlop (Second Secretary, British Embassy, Buenos Aires, Argentina), Harriet Beach (Second Secretary, British Embassy, Buenos Aires, Argentina), Christopher Wright (Political Consular, British Embassy, Brasilia, Brazil), Daniel Matthews (Argentina Desk Officer, FCO), Edward Strudwick (Brazil and Southern Cone Desk Officer, FCO) (Figure 8).

Figure 8: FCO visit to SAERI.

At the IUCN UK Peatlands Conference – Peatlands, Investing in the Future – held in Belfast in October 2019, the UKFIT Project Partner gave a poster presentation highlighting the project: *Mapping the Peatland Resource in the Falkland Islands (UKOT)* (Figure 9). He also attended and contributed information about the project to sessions at this conference on:

- Peatlands: climate change & greenhouse gas accounting
- Peatland progress - UK Strategy in action
- Peatland restoration: emerging ideas & current challenges
- Engaging with key stakeholders at a practical & policy level.

As a UK Oversees Territory (OT), the significant contribution the Falklands' peatlands make to the UK total peatland and carbon stocks was highlighted and came as a surprise to most delegates. This heightened interest in the project at a wider level.

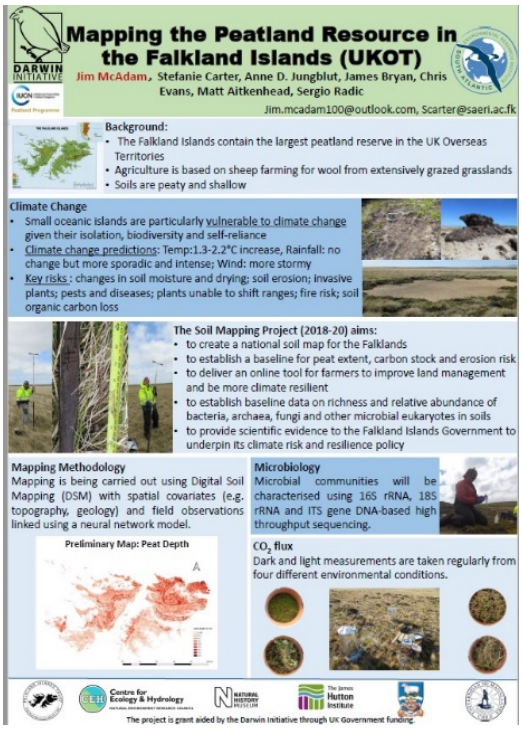


Figure 9: Poster presentation at the IUCN UK Peatland Conference in Belfast, Northern Ireland.

The UKFIT Project Partner also helped organise a one-day seminar at the Agri-Food and Biosciences Institute (AFBI) and Queen's University Belfast in October 2019 on "Climate Change

in the UK Overseas Territories". At this seminar Tara Pelembe (Deputy Director, SAERI) gave an overview presentation "Climate change in the South Atlantic" which set the scene for the Soil Mapping Project. Subsequently, the UKFIT Project Partner held a presentation on "Climate change predictions, predicted risk to terrestrial ecosystems and mitigation strategies for the Falkland Islands", which described the operation and potential outcomes of the Soil Mapping Project (Figure 10).

Figure 10: UK FIT Project Partners presents the Soil Mapping Project at an AFBI seminar.

The Chartered Institute of Ecology and Environmental Management (CIEEM) in the UK has a Special Interest Group (SIG) on Overseas Territories (OTs), which hosted an Autumn Conference in November 2019 through Zoom videoconferencing. The PM participated with a pre-recorded conference on "The significance of understanding and protecting soil in the Falkland Islands". The presentation was subsequently made available via YouTube and the project website and promoted through Facebook and Twitter (Figure 11).

Figure 11: Promotion of CIEEM SIG OTs Autumn Conference presentation on Facebook (left) and Twitter (right).

The JHI Project Partner Matt Aitkenhead also attended the Soil Organic Matter conference in Adelaide, Australia, in October 2019, where he promoted the project to ca. 300 soil science researchers and representatives from farming groups, regulatory bodies and policy engagement groups. The conference report is available on the project website.

3. Project progress

3.1 Progress in carrying out project Activities

Output 1 - Project Management Structure

Summary: All of the activities planned for this reporting year have been completed.

At the end of the first project year the Memorandum of Understanding (MoU) had been signed by SAERI, JHI, UK FIT and UKCEH; this was followed by signatures from FIG and NHM in this project year. The signed versions are available on the project website. There is still one outstanding organisational partner signature (UMAG) which we continue to follow up including through face-face discussion. (SAERI's Executive Director Paul Brickle discussed the MoU during a visit to UMAG in January 2020; the UKFIT Project Partner had arranged to meet officials of UMAG to work on the MoU process during a visit in early March, but this had to be cancelled due to COVID-19 restrictions in Chile). The MOU signing process is significantly slower than anticipated. Nonetheless, the two UMAG project partners (Sergio Radic and Roberto Jara) received individual contracts with SAERI directly and still participated in the fieldwork as planned therefore project progress has not been impacted. (**Activity 1.1**). Quarterly PMG meetings were held in April, July, October 2019 and February 2020. The meeting minutes are available on the project website (**Activity 1.3**).

The annual Farmer's Week commences with an Expo for the general public. For this event SAERI organised a stall, which included a poster, display and activity from the Soil Mapping Project. The PM was present all day, explained a local soil profile, re-built the soil profile with children and displayed preliminary maps (Figure 4). Later on in the week the PM presented the project process to local stakeholders, which was followed by a chance to ask questions and discussed the project; great interest was received (Figure 5). More detail is available in section 2 – local stakeholders (**Activity 1.4**).

Project stakeholder workshops were held on 14 February in Stanley (East Falkland) and on 17 February in Fox Bay (West Falkland). Additionally, 1-1 sessions were held for anybody interested in the project but unable to attend the workshops. This is described in detail in section 2 – local stakeholders; the workshop report is available on the project website, individual presentations are available on the project website and an overview of stakeholder engagement is available in Annex 3 (**Activity 1.4**).

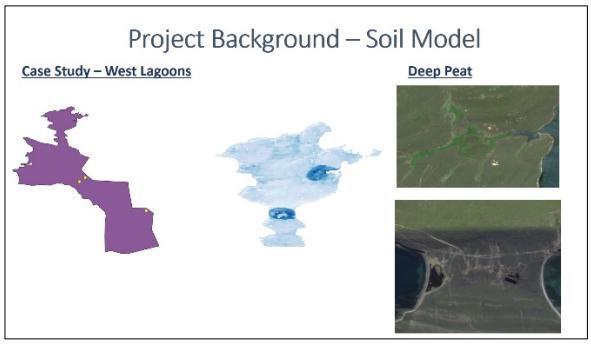
The project website is updated regularly through the latest news section and the project download area (**Activity 1.5**).

Output 2 – WP1: National Soil Map, peatland distribution and soil erosion extent / risk

Summary: All of the activities planned for this reporting year have been completed.

A first set of preliminary maps was issued in April 2019 with physical data from the first field season at a 100 m per pixel resolution. These were explained and presented to local stakeholders during Farmer's Week in July. The concept of soil modelling is difficult to explain and stakeholders often do not understand how we can know about soil properties from areas where we did not collect any samples. To demonstrate how the modelling works, we presented a case study based on a farm from West Falkland (Figure 12). The first set of maps was refined by the addition of chemical data and soil class from the first field season and new maps were issued in January 2020. These were used for stakeholder engagement in February 2020. Examples are presented in Figure 13. A full report on progress with soil modelling and map production by project partner Matt Aitkenhead is available on the project website (**Activities 2.6 and 2.11**).

The main fieldwork campaign in this project year ran from 3 November to 20 December 2019 and additional fieldwork trips were completed in October 2019, January and February 2020. The fieldwork report is available here (**Activity 2.8**). Data analysis and processing was completed in March 2020 and the data were subsequently made available to project partners via email and google drive (Figure 14, **Activity 2.9**).



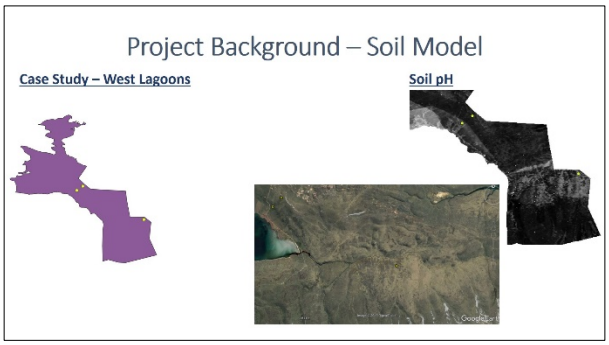


Figure 12: Case study with preliminary maps from West Lagoons (West Falkland) at 100 m per pixel resolution. Left image: the model predicts deep peat for the dark blue patches which were confirmed by the landowner to be deep areas. Right image: Low pH is predicted for grey pixels, which is identified as acid grassland by the landowner and satellite imagery.

Figure 13: Examples of re-issued maps: soil class (left), erosion (centre), magnesium (right).

Figure 14: All fieldwork and lab data were shared with project partners via google drive.

Output 3 – WP2: Assessment of the sustainability of soil management practices and of soils physical, chemical and microbiological properties

Summary: One of the two activities planned for this reporting year have been completed.

The protocols for molecular biology, sequencing and bioinformatics analyses have been determined and have been made available on the project website (**Activity 3.3**). The molecular biology analyses for the samples collected for the soil microbiology study commenced in this project year. Analyses are carried out at the Molecular Laboratories, NHM. Processed samples are being logged onto a shared google file, which is documenting the sample identifier, date of sample processing for DNA extraction, DNA extraction and test PCRs on selected DNA extracts for the taxonomic 16S rRNA gene marker (Figure 15). The work could not be completed as scheduled which is explained by NHM in the following statement *"Reasons for the delays were additional PCR tests to confirm that DNA yields were of sufficient quality and quantity to generate PCR products from all types of soils before up scaling the number of extractions per batch. Further delays are due to COVID-19. In accordance with UK government regulation, the Museum asked all staff including scientists like me to get ready for working at home from beginning of March which meant that I could not continue with the practical laboratory work for the project. The formal announcement of the closure of the Museum was on the 17 March with a subsequent UK-wide lock down. I will continue with the practical work for the project as soon as i will be able to work at the museum again to deliver the sequencing outputs."* (**Activity 3.5**).

The chemical and physical lab analyses of the soil samples collected in the final fieldwork campaign was completed as planned and within the project's internal timeline. In the first project year these analyses were carried out by the lab technician at the DoA but time constraints meant he had limited availability this year. The PM therefore carried out most of the analyses herself recruiting a local assistant for the completion of this work (Figure 16). Completed data were uploaded to the google drive (Figure 14, **Activity 3.7**).

	Sample name	DNA processed for DNA extraction	date of DNA extraction	Weight (g)	
94A	FI25-1A	14 January ADJ	24/1/20	0.203	PCR 515f+4
95A	FI25-2A	14 January ADJ	24/1/20	0.232	PCR 515f+5
96C	FI25-3C	14 January ADJ	24/1/20	0.209	
97C	FI25-4C	14 January ADJ	24/1/20	0.141	
98A	FI27-1A	14 January ADJ	24/1/20	0.248	
98B	FI27-1B	14 January ADJ	24/1/20	0.251	
98C	FI27-1C	14 January ADJ	24/1/20	0.234	
101A	FI8-2A	14 January ADJ	24/1/20	0.188	
103B	FI8-4B	14 January ADJ	24/1/20	0.147	
104B	FI9-1B	14 January ADJ	24/1/20	0.262	
105A	FI9-2A	14 January ADJ	24/1/20	0.213	
105B	FI9-2B	14 January ADJ	24/1/20	0.197	
106C	FI9-3C	14 January ADJ	24/1/20	0.262	
118B	FI-1B	14 January ADJ	24/1/20	0.22	
119C	FI27-3C	14 January ADJ	24/1/20	0.248	
91A	FI33-2A	13 January ADJ	24/1/20	0.277	
97B	FI25-4B	13 January ADJ	24/1/20	0.227	
100A	FI8-1A	13 January ADJ	24/1/20	0.247	
107A	FI9-4A	13 January ADJ	24/1/20	0.212	
112B	FI11-1B	13 January ADJ	24/1/20	0.244	
74A	FI5-1A	13 January ADJ	17/1/20	0.227	
74C	FI5-1C	13 January ADJ	17/1/20	0.235	
75A	FI5-2A	13 January ADJ	17/1/20	0.155	
75B	FI5-2B	13 January ADJ	17/1/20	0.101	
75C	FI5-2C	13 January ADJ	17/1/20	0.191	
76A	FI5-3A	13 January ADJ	17/1/20	0.288	
76C	FI5-3C	13 January ADJ	17/1/20	0.235	PCR 515f+2
77A	FI5-4A	13 January ADJ	17/1/20	0.215	PCR 515f+3
77B	FI5-4B	13 January ADJ	17/1/20	0.267	
77C	FI5-4C	13 January ADJ	17/1/20	0.296	
78B	FI6-1B	13 January ADJ	17/1/20	0.13	
79Ci	FI6-1C	13 January ADJ	17/1/20	0.405	
79Cii	FI6-2C	13 January ADJ	17/1/20	0.174	
85C	FI35-4C	13 January ADJ	17/1/20	0.193	
90C	FI33-1C	13 January ADJ	17/1/20	0.219	
78A	FI6-1A		17/1/20	0.206	
64C	FI2-1C	14 January ADJ	16/1/20	0.216	PCR 515f+0
65A	FI2-2A	14 January ADJ	16/1/20	0.191	PCR 515f+1

Figure 15: Microbiology soil samples were thawed for DNA extraction (left) and sample processing is documented on a shared google drive (right).

Figure 16: PM preparing soil samples for the pH testing (left), lab assistant Kate Stenning weighing samples for organic matter (centre), PM carrying out analysis for chloride content (right).

Output 4 – WP3: Development of soil spatial database and interactive tool for interpreting and describing soils properties and health, displaying soil erosion risk on selected farms. The tool supports stakeholders' actions for mitigating with climate change effects

Summary: All of the activities planned for this reporting year have been completed.

The data management plan was updated in August 2019 and the latest version is available on the project website (**Activity 4.1**). The spatial database in PostgreSQL was updated with the data from the first fieldwork season and the latest issued maps were uploaded to the preliminary webGIS site established for the soils project (Figure 17, **Activity 4.3**). All project data are stored on the local data centre server (Figure 18) and all data and project files required by project partners are uploaded to the google drive (example Figure 14, **Activity 4.4**).

The interactive tool delivered to local stakeholders was first discussed during the stakeholder workshops in the beginning of 2019 when it became apparent that rather than an online tool, farmers preferred an offline version that they can take out into the field with them. One landowner suggested layered pdf maps. The idea was taken forward and discussed with stakeholders during Farmers Week in July 2019 and during workshops in February 2020. Attendees seemed agreeable with the idea and no other formats were suggested (**Activity 4.5**). For each farm individual maps with all the layers will be exported from QGIS and then collated into a layered

pdf file with the appropriate software. Maps will contain all necessary information, such as scale and legends in order to allow appropriate interpretation (**Activity 4.6**).

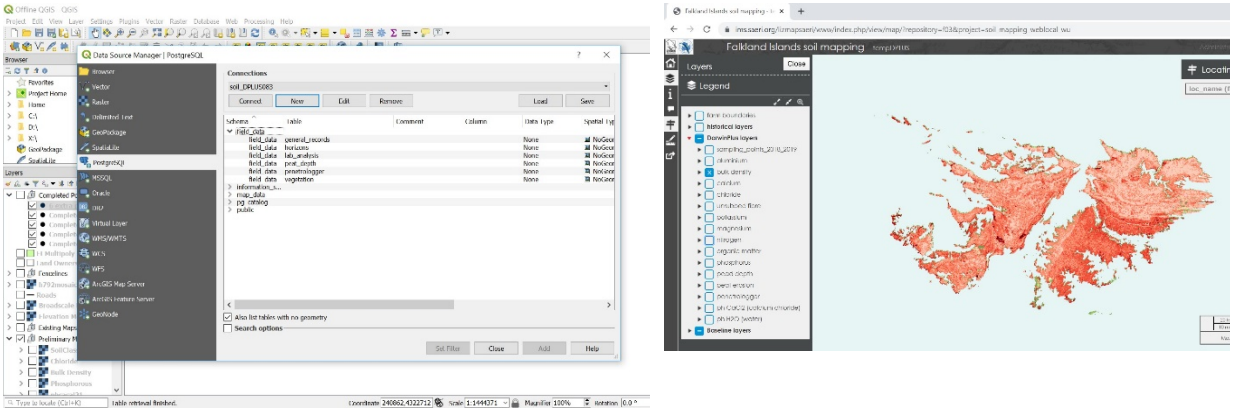


Figure 17: Screenshots of the up-to-date PostgreSQL data base (left) and the webGIS with latest maps (bulk density is ticked).

Figure 18: Local data centre server with all project files.

Output 5 – WP 4: Knowledge transfer workshops and training courses

Summary: All of the activities planned for this reporting year have been completed.

A formal workshop to teach how to collect soil samples for future monitoring works was not required. The sample collection is very non-technical and does not require formal training. 'On the job' skill-transfer was undertaken during the project: the Falkland Conservation Habitat Restoration Officer Katherine Ross joined project fieldwork in December 2019 (see fieldwork report 1) and the current Agronomist at the DoA Matt McNee joined project fieldwork in February 2020 (Figure 19). Knowledge for future sample collections and monitoring will therefore be sustained beyond the project end date in the Islands (**Activity 5.1**). The subject areas for the remaining workshops planned for year 2 were combined into two workshops held in February 2020. The presentations given during the workshops explained the use of satellite imagery in the project, demonstrated the use of the interactive tool that will be delivered to landowners, covered the background to fieldwork and soil modelling, explained soil classes encountered and addressed greenhouse gas emissions from peatlands. Please see workshop report for details and slide examples in Annex 4 (**Activities 5.2, 5.3, 5.4**).

The preliminary maps were presented at the annual Farmer's week in 2019 (please see section 2 – local stakeholders and Figure 5; **Activity 5.5**).

The project involved a range of volunteers and assistants – local and international. Local capacity building was through work experience student Hamish McKee, who joined the fieldwork for a day in April 2019 and young local boy Jack Cartwright joined the gas flux work during the winter of 2019 for work experience; fieldwork photos as evidence can be provided upon request but are not included in this report as both boys were minors at the time of participation. DPLUS071 MMA's project intern Lauren Shea helped the PM set up the gas flux experiment (Figure 20) and Canadian Erin Shankie joined the fieldwork for three weeks in November 2019 (Figure 20). DPLUS071 MMA's Project Officer Marina Costa joined the fieldwork on a weekend trip to Gibraltar Station (Figure 21) and local Sammy Hirtle volunteered her time to complete the fieldwork on Weddell Island (Figure 21). Finally, Kate Stenning – a young local woman who had just completed her studies in the UK – was hired as the lab assistant, which also provided an opportunity to informally discuss science opportunities and potential careers (Figure 16) (**Activity 5.6**).

The project was promoted to other UKOTs through SAERI's Facebook posts, tweets and project partner's blogs (example here). SAERI's close working relationship with other UKOT's means that these communication channels are also interlinked and therefore projects are promoted. The project was further promoted to UKOT's through a presentation at the CIEEM UKOTS autumn conference (see section 2 – global stakeholders and Figure 11) (**Activity 5.7**).

Figure 19: The DoA's Agronomist Matt McNee joining fieldwork near Fox Bay, West Falklands.

Figure 20: Volunteers Lauren Shea (left) and Erin Shankie (right) in the field.

Figure 21: Volunteer Marina Costa with landowner Nick Pitaluga at Gibraltar Station (left) and volunteer Sammy Hirtle on Weddell Island (right).

3.2 Progress towards project Outputs

Output 1 – Project Management Structure.

Six out of seven parties have signed the MoU; signed versions are available on the project website. As explained in section 3.1 there is a delay with UMAG signing the MOU due to administrative hurdles. The signing of the MoU is still being pursued (**Indicator 1.1**). Quarterly PMG meetings were held in April, July, October 2019 and February 2020. The meeting minutes are available on the project website (**Indicator 1.3**). The 6-monthly stakeholder contact was maintained as planned. The events for Farmer's Week were highlighted in section 2 – local

stakeholders – and Figures 4 and 5; the workshop report is available on the project website, individual presentations are available on the project website and an overview of stakeholder engagement is available in Annex 3. (**Indicator 1.4**). The project website is updated regularly through the latest news and the document download area (**Indicator 1.5**). Indicators are appropriate.

Output 2 – WP1: National Soil Map, peatland distribution and soil erosion extent/risk

A first set of preliminary maps was issued in April 2019 with physical data from the first field season at a 100 m per pixel resolution, which were made available to project partners as GIS layers. These were also explained and presented to local stakeholders during Farmer's Week in July (Figure 22). The first set of maps were refined by the addition of chemical data and soil class from the first field season and new maps were issued in January 2020. Examples are presented in Figure 13. A full report on progress with soil modelling and map production by project partner Matt Aitkenhead is available on the project website (**Indicators 2.4 and 2.8**). The main fieldwork campaign in this project year ran from 3 November to 20 December 2019 and additional fieldwork trips were completed in October 2019, January and February 2020. The fieldwork report is available here (**Indicator 2.7**). Indicators are appropriate.

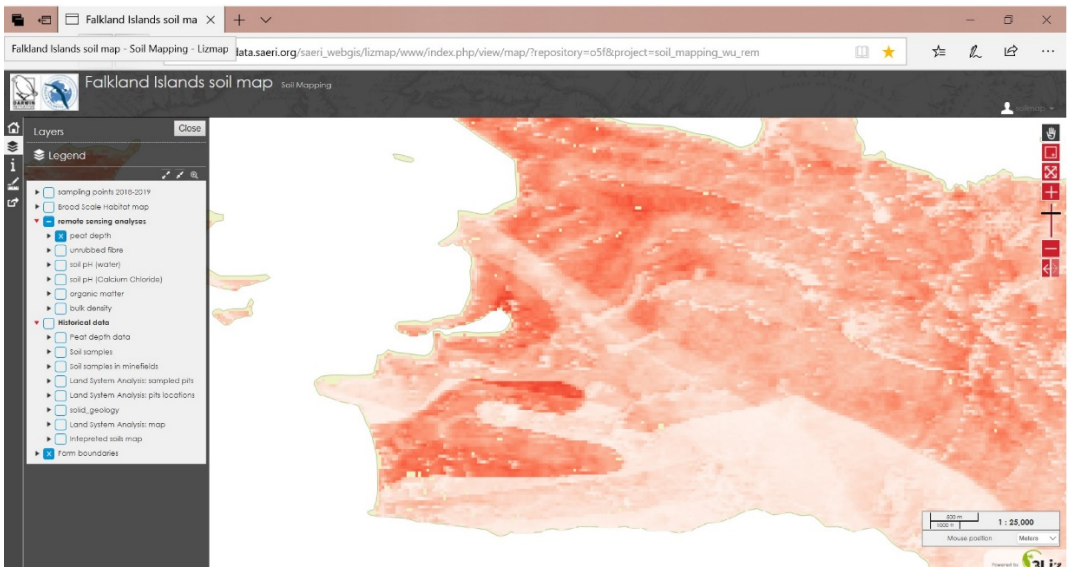


Figure 22: Example of a preliminary map for peat depth created in April 2019.

Output 3 – WP2: Assessment of the sustainability of soil management practices and of soils physical, chemical and microbiological properties

The chemical and physical lab analyses of the soil samples collected in the final fieldwork campaign was completed as planned and within the project's internal timeline. In this project year the PM carried out most of the analyses herself with an assistant hired particularly for the completion of this work (Figure 16). Completed data were uploaded to the google drive (Figure 14, **Indicator 3.1**).

As outlined for Activities 3.3 and 3.5 the methodology for the microbiology has been updated and made available on the project website and analyses have commenced. The work could not be completed as scheduled which is explained by NHM *"Reasons for the delays were additional PCR tests to confirm that DNA yields were of sufficient quality and quantity to generate PCR products from all types of soils before up scaling the number of extractions per batch. Further delays are due to COVID-19. In accordance with UK government regulation, the Museum asked all staff including scientists like me to get ready for working at home from beginning of March which meant that I could not continue with the practical laboratory work for the project. The formal announcement of the closure of the Museum was on the 17 March with a subsequent UK-wide lock down. I will continue with the practical work for the project*

as soon as i will be able to work at the museum again to deliver the sequencing outputs." (**Indicator 3.2**).

Indicators are appropriate.

Output 4 – WP3: Development of soil spatial database and interactive tool for interpreting and describing soils properties and health, displaying soil erosion risk on selected farms.

The interactive tool delivered to local stakeholders was first discussed during the stakeholder workshops in the beginning of 2019 when it became apparent that rather than an online tool, farmers preferred an offline version that they can take out into the field with them. One landowner suggested layered pdf maps. The idea was taken forward and explained to stakeholders during Farmers Week in July 2019 and during workshops in February 2020. Attendees seemed agreeable with the idea and no other formats were suggested (**Indicator 4.1**). The spatial database in PostgreSQL was updated with the data from the first fieldwork season and all the latest maps have been uploaded to the preliminary webGIS (Figure 17); the databases are therefore prepared for the final set of data. Project partners have access to these and the webGIS was demonstrated to stakeholders (see workshop report, **Indicators 4.5 and 4.6**). Indicators are appropriate.

Output 5 – WP 4: Knowledge transfer workshops and training courses

Two workshops were held in February 2019 that explained the project's background of soil modelling and field work and illustrated with a case study how the final maps can be utilised for land management (see workshop report and slides examples in Annex 4; **Indicator 5.1**). Indicators are appropriate.

3.3 Progress towards the project Outcome

The progress towards the project outcomes in year 2 was excellent. All the fieldwork and lab analyses for chemical properties was completed and shared with the JHI project partner within the project's internal timeline (see fieldwork report, Figures 14 and 16). Two rounds of modelling and map creation (April 2019 and January 2020) were completed and the issues encountered were successfully mitigated so that the final round of map creation can be completed smoothly (see Activities 2.6 and 2.11, Figures 12 and 13 and mapping progress report. The webGIS and the PostgreSQL database have been prepared with all of the data that were available by March 2020 and will therefore be able to receive all of the remaining data in due course (see Activity 4.3 and Figure 17). The stakeholder engagement side of the project occurred regularly as planned and has provided valid feedback (see section 2).

All of these activities have contributed to **Outcome 0.1** which aims to construct a distribution map of soils, peatlands and erosion extent for the Falkland Islands to fill a knowledge gap and provide information on a fundamental natural resource which needs sustainable management. The indicator is appropriate. **Outcome 0.2** is described as an online tool; however, stakeholder engagement has revealed that an offline version of the maps is preferred (see Activity 4.5). Once Outcome 0.1 is completed, pdf versions for each farm will be issued and collated into a layered pdf. This will then be delivered to each farm on a memory stick accompanied by an interpretation guide for each of the map layers so that the offline maps can be used in a meaningful way.

The indicators are appropriate and the project is highly likely to achieve Outcomes 0.1 and 0.2.

3.4 Monitoring of assumptions

The PMG meets regularly and discusses any issues that arise and jointly finds solutions. This process has worked very well so far. One example are some issues, which arose with modelling and map production when the first set of maps were issued in April 2019. This is a normal process and it is therefore important to issue several trial maps in order to find solutions before the final product needs to be completed. All of the issues have been addressed now (see progress report) and the PMG is confident that the remainder of the modelling and map creation will run smoothly.

Out of the risks and assumptions initially identified in the project's log frame, the following is still relevant:
For **Output 1 Assumption 1.1** still holds true because not all project partners have signed the MoU. All work directly managed by the PM is currently on schedule, which means the PM should complete the final project report on time (**Assumption 1.7**). The PMG has been meeting regularly (see meeting notes) and is most likely to uphold the current 3-monthly schedule for meeting (**Assumption 1.3**). All other assumptions have become irrelevant because the related activities have been completed.
All of the assumptions for **Output 2** have become negligible because the activities have either been completed (**Assumptions 2.1, 2.4, 2.5, 2.6, 2.7**) or risks have been mitigated (**Assumptions 2.2, 2.3**). For the latter assumptions, risks have been mitigated by the selection of almost cloud-free imagery and with a modelling solution for the remaining cloud-covered areas (see progress update report).
The first assumption for **Output 3** refers to the chemical and physical soil analyses, which have been completed; **Assumption 3.1** therefore has become irrelevant. **Assumption 3.2** is still valid; the microbiology lab work can only be completed if the required consumables are available. **Assumption 3.3** has become negligible, the physical and chemical lab work has been completed and initial testing for the NHM microbiology lab work was successful (see PMG meeting notes). **Assumptions 3.4** is still valid; whilst the data from the physical and chemical analyses are available, the microbiology analyses are not complete and therefore not available yet.

Assumptions 4.2, 4.3 and **4.6** for **Output 4** have become negligible because the database and the webGIS have been prepared and just need to receive the final data now (Figure 17). **Assumptions 4.1** and **4.5** are also negligible because stakeholder consultation on project delivery is completed and data sharing between project partners is on-going and working well. **Assumption 4.4** has also become negligible because the offline tool for stakeholder makes the requirement for lost-cost internet redundant.

For **Output 5 Assumptions 5.3** still holds true whilst **Assumptions 5.1** and **5.2** have become negligible as the stakeholder consultation has been completed.

However, an unexpected risk has occurred which might delay some of the project work: due to the rapid spread of COVID-19 most public offices are now closed down in the UK which means that project partners have to work from home for the foreseeable future.

Project partner Matt Aitkenhead (JHI) has been greatly affected by this: he is able to run the soil modelling and map creation from his laptop at home; however, in order to do so he needs to connect with the servers at the JHI. Map creation is regularly interrupted by system crashes due to increased demands on the servers' remote connections. Nonetheless, at the time of report writing, Matt was able to make the process work. Although the map generation will take longer than anticipated, it should still be completed within the project logframe. The new assumption is that the JHI servers' remote connections will continue to work and that no new obstacles arise which may hinder the completion of the work.

The microbiology lab work will recommence as soon as the NHM is accessible for staff (it is currently closed due to COVID-19) and we anticipate that the work will be completed before the project will finish. However, COVID-19 developments are uncertain. Therefore, the new assumption is that the NHM laboratories will become accessible for staff within a time period that allows sufficient time to complete the microbiology work by the end of project.

4. Project support to environmental and/or climate outcomes in the UKOTs

Climate change has been highlighted as the greatest long-term threat facing UKOTs. Although the Falkland Islands were not included in early knowledge gap analyses to identify the impacts

of global climate change on the UKOTs (Sear *et al.,* 2001[1]), the need to understand Climate Change Adaptation, Mitigation and Ecosystem Services in all the UK Overseas Territories has been highlighted by Defra since 2008 (Brown, 2008[2]).

The current project follows on from an EU BEST funded project (2013-2017) – Terrestrial Ecosystems of the Falklands – a Climate Change Risk Assessment (TEFRA). The overall aim of TEFRA was to inform Falkland Islands Government policy development by providing an assessment of the current evidence base relating to the potential impacts of climate change on plants and soils of the Falkland Islands and the services they provide. Following climate change predictions for the Falklands Islands, stakeholder consultation and a thorough review of all the available science from the Falklands and equivalent regions and habitats, the key risks identified from TEFRA were:

- Changes in soil moisture deficits and drying
- Changes in soil organic carbon
- Changes to invasive plant species and plant pests and diseases
- Habitat disturbance by extreme events – increased fire risk
- Changes in range, yield and quality of crop/ forage varieties/ species grown

The underlying feature to all of these impacts was the importance of the peatland resource in the Falklands. Two of the key impacts were:

- Changes in soil moisture deficits and drying out

Climate change is predicted to increase soil moisture deficits with potentially large knock-on effects on soil health. In the Falkland Islands evapotranspiration during spring and summer is predicted to increase, with a swing towards a greater increase in the spring soil deficit rather than later in the growing season.

- Changes in soil organic carbon

Total soil organic carbon estimates for the Falkland Islands are weak and based on soil type coverage estimates for individual geological mapping units. Based largely on proxy research on similar northern hemisphere peaty soils, predicted climate change is likely to lead to Falkland peatlands as a whole becoming a carbon source rather than sink.

Hence, from a sound evidence base, the strategic long-term requirements identified to manage Falklands natural environment was, developing a climate change mitigation strategy that focused on sustainable management of the fragile soil resource. To achieve this, the TEFRA project highlighted the need for a soil type and depth distribution map and a more accurate assessment of the soil carbon stocks to plan land use strategies, which will help ameliorate the risk from climate change and promote sustainable use of Falkland's peatlands.

The current project is a direct follow-on from the TEFRA project and will address the main strategic long-term outcomes for the natural environment in the Falklands. Skill in the application and usage of the outcomes, and tools from the current soil mapping project, will be transferred to the stakeholders – mainly farmers and habitat restoration and agricultural extension workers – ensuring that the programme will improve capacity to manage environmental assets in the Falklands. The outcomes from the project will be readily transferrable to other OTs where soil moisture deficits and soil sustainability are major climate change challenges.

The project also feeds into UK Government targets for climate change and greenhouse gas emissions through the UKCEH project partner. The UK Government has been requested to improve its reporting of land-use related greenhouse gas emissions and removals for the UKOTs, and the Falklands has been identified as a particular priority given its large land area. Key

[1] Sear, C.; Hulme, M.; Adger, N. and Brown K. (2001) *The Impacts of Global Climate Change on the UKOT: Issues and Recommendations*. Tyndall Centre for Climate Change Research. Natural Resources Institute.

[2] Brown, N. (2008) Climate change in the UK Overseas Territories: an overview of the Science, Policy and You. Defra.

requirements for land-use emissions reporting are spatial data on soils and land-cover, and measurements of greenhouse gas fluxes, all of which are being produced during the project. The UK's land-use inventory is maintained by the UKCEH project partner, so final outputs from the project are expected to feed directly into this process.

Project Partner UKCEH, along with the Green Alliance, is currently undertaking a small scoping study for Falklands Conservation and the Royal Society for the Protection of Birds on the potential to develop a land-use carbon offsetting scheme for the Falklands, with a focus on peatland management and restoration. This work is being informed by the results of the Darwin Plus project, with input from project participants Chris Evans, Jim McAdam and Steffi Carter. If the scoping study does lead to the future development of an offsetting scheme, this will be highly reliant on the soil maps produced during the project, and could support the implementation of climate change mitigation in the Falklands, as well as developing new potential sources of income for the conservation and farming sectors.

Progress.

1. A soil sampling strategy based on existing natural resource maps has been devised and implemented in the field.
2. All required samples have been successfully collected for soil chemical and physical analyses in the Falklands and soil microbiological analyses in the UK. The chemical and physical analyses have been completed.
3. Stakeholder engagement is on target. At least 11 landowners covering a range of soil types and management practices have agreed to participate in the pilot stages of the project to test and refine the digital soil maps.
4. Draft maps based on data collected in the first field season have been created and have been presented to local stakeholders to demonstrate the farm planning power of these maps.
5. Awareness of the importance of the peatlands in the Falklands as a major contributor to UKOT (and UK) peatland resources increased substantially through the UK FIT project partner's attendance at the IUCN UK Peatlands Conference (see section 2, global stakeholders) and the work carried out by the UKCEH project partner as described above.
6. Local capacity for future environmental management is increased through the inclusion of local volunteers, work experience students, assistants and stakeholders in the practical project work. This will have enhanced knowledge on environmental matters and taught practical skills in aspects of environmental management to local participants.

5. OPTIONAL: Consideration of gender equality issues

In the SAERI office, the current staff cohort is 60% female and 40% male, and SAERI has an equal opportunities policy as part of its internal policy framework. The project leader and PM of the Soil Mapping Project are both female.

Most of the farms on the Falkland Islands are family owned or family managed, with both the men and women within the households making an active contribution to the maintenance and development of the farm and the farm business. While it might generally be the male members of the household who will be using the maps in the field, any positive impact on the farm business as a result of the increased evidence provided will benefit the family as a whole. Attendance at the most recent stakeholder workshops was 47% females vs. 53% males (see workshop report for attendees), which illustrates how evenly balanced interest in the project is.

The real importance is that the project maps will be made available to everyone and that gender will not be a barrier to access the outcomes.

6. Monitoring and evaluation

A Monitoring and Evaluation (M&E) plan was developed for the project and is available on the project website; no changes have been made to it during the reporting period. The project is governed through an establish PMG which is formed by all project partners. The project partners work well together and regularly meet to discuss and steer the project. The project manager

updates the PMG in these quarterly meetings on the deliverables in the log frame, the M&E, and budget. The PMG uses Google Drive to share documents and all project partners have editing rights (Figure 14).

It is the PMG's responsibility to facilitate project delivery on time and within budget and to review the quality of the outputs. Engagement and involvement of stakeholders ensures that the outcome delivered through the product actually meets stakeholder requirements. The indicators of achievements is the evidence produced by each activity (e.g. reports, maps, methodologies). Section 3 outlines how the activities feed into the project outputs and outcomes.

7. Lessons learnt

Possibly the most important lesson from this project in terms of project management and timeline planning is that all projects using novel approaches should allow for a considerable trialling time of these approaches in order to assure that the final run goes ahead smoothly. This aspect has worked particularly well in this project. The first maps were produced in April 2019 and it took most of this project year including three PMG meetings and another map re-iteration to mitigate all issues that had arisen. The JHI project partner wrote bespoke code to carry out automated soil classifications used to deliver project maps. As with most new applications, there were initial teething issues, which required manual comparison of data, before the code could be applied. The success in this project is that all soil models and the classification code are now ready to receive the final data and will be able to produce the project outcomes without any technical delays.

Receiving the signature of all project partners for the project's MoU has proved very difficult in this project with one signature still outstanding due to administrational challenges. Nonetheless, the project partners worked well together without a signed MoU and it has not impeded project delivery. As the MoU is not a legally binding document, it may therefore not be a requirement for successful projects.

Attendance at the second stakeholder workshops has much improved compared to the first round of workshops. In the first year the Soil Project was not as well-known across the Islands and it is likely that a small community in a remote place such as the Falkland Islands might need time to embrace a large-scale externally funded project. On-going engagement by the PM, UK FIT Project Partner and FIG DoA project partners increased awareness of the project but more importantly highlighted how the final outcome – soil maps – can be applied for improved and sustainable land management; this generated increased interest in the project. A strong stakeholder engagement side has therefore proven vital for the success of this project and should be seen as a fundamental requirement for all territory-based projects.

Having the PM based in the Falkland Islands for the duration of the project was vital for project success. The stakeholder engagement side in particular hugely benefitted from her continued presence. Landowners and land managers have busy schedules, which do not conform to regular office hours and working days. Therefore, engagement needs to take that into consideration and be carried out on stakeholders' terms in order to be successful. Examples include the managers at Fitzroy Farm who were unable to attend any of the stakeholder engagement events, yet wanted to be involved in the project. The PM therefore visited them on the farm and presented the project at a time suitable for them. Another landowner was very interested in the project and wanted to join the fieldwork but only had time outside of the main fieldwork campaigns. The PM therefore completed the four points on his farm in October 2019 with the help of a volunteer. By being present in the Falklands Islands for the duration of the project the PM was also able to maximise the skills and experience available in the SAERI office, through discussing experiences with other DarwinPlus project managers and enhancing her own GIS skills with the help of her colleagues. Whilst projects such as this one could probably be delivered without the PM being present locally throughout the project, the continued presence of the PM maximises impact and success for everyone involved.

8. Actions taken in response to previous reviews (if applicable)

In the AR1 review it was suggested to communicate indicator changes with Darwin. This was subsequently dealt with and approved through change request #3. This involved changing two indicators in the logframe:

Indicator 1.4 was changed from “project stakeholder group (PSG) meeting held every 6 months starting May 2018” to “6-monthly stakeholder engagement will be maintained through workshops and 1-1 contact during the summer and through a presentation and 1-1 meetings during the annual Farmer’s Week in July”.

Indicator 5.3 was changed from “A training course to be delivered by microbiology specialists to local scientists, interested stakeholders and to the DoA laboratory technician. The training course will take place indicatively in the last quarter of year” to “Training on gas flux measurements for local scientists and interested stakeholders so that monitoring work can be continued.”

9. Other comments on progress not covered elsewhere

n/a

10. Sustainability and legacy

The profile of the project had previously been promoted and discussed at several levels within the Territory.

<u>At the highest level in Government</u>

1. Governor, Governor Nigel Phillips.
2. Members of the Legislative Assembly (MLAs) Ian Hansen (FLH & Deputy Portfolio Holder-Natural Resources), Teslyn Barkman (Portfolio Holder-Natural Resources and Deputy Portfolio Holder-Environment and Public Protection) and Leona Roberts (Portfolio Holder-Environment and Public Protection)
3. Environment Officer and Policy Adviser, Denise Blake.

These officers are still aware of progress with the project.

<u>Within relevant government departments and relevant institutions and NGOs</u>

1. The newly appointed Head of the Department of Natural Resources, Dr Andrea Clausen, was briefed and has confirmed the support of her department for the project, particularly in relation to follow-up and legacy issues. Department of Agriculture staff engage fully with the project. Detailed briefing and forward discussions were held with the new Senior Agricultural Advisor, Tom McIntosh. The interest and involvement by a key government department has gradually grown as the project has developed. Staff have increasingly realised the potential value of the project outputs to assist them with future work schedules and projects which extends well beyond the duration of the Soil Mapping Project.
2. The local NGO, Falklands Conservation, has been briefed on the project and is fully aware of its value for nature conservation in the islands. This was further emphasised within this year through a thorough briefing session with the Conservation Manager and the Habitats Restoration Officer.
3. SAERI is fully aware of the project and has added substantial capacity to the outcomes by involving outputs from other, related projects they are involved with. SAERI’s new Deputy Director for Science has been thoroughly briefed on the project and attended the one of the workshops.
4. Project outreach has also revealed new and unexpected applications of the soil maps. A meeting took place between SAERI (including the PM) and members of staff from Falkland Islands Emergency Services, including the Chief Fire Officer in July 2019, during which it was revealed that information on peat depth overlayed with information on vegetation from the DPLUS065 Coastal Mapping Project will identify high risk fire areas.

The Chief wrote a letter of support for both projects, which is available in Annex 5. Subsequently, the maps produced by both projects were also discussed in a follow-up meeting with the Director of Emergency Services in October 2019.
Furthermore, the UK FIT project partner also engaged with the Veterinary Department which revealed that information on peat depth deriving from this project will help with their 'Foot and Mouth' Strategy (burying of deceased animals in deep peat).

With eventual end users and other stakeholders
In addition to the above-mentioned stakeholders, farmers and other landowners will be the direct beneficiaries of the project. They have been made aware of the project through: the local farmers' magazine (Wool Press), their regular interaction with the DoA's extension agronomist and project partner Matt McNee, two stakeholder events, individual farm owner visits and one-to-one presentations and discussions.

With the general public in the Falklands
All project-related events are advertised on local radio and the workshops were open to all members of the public. The PM also gave a radio interview on the project's gas flux study (17 July 2019) and provided information for a radio piece on World Soil Day (5 December 2019, see latest news). Project progress is regularly communicated through Facebook and Twitter.

Now that the project has completed the field sampling phase, due to the above interactions, it is widely known and its profile has steadily increased over the year. The number of farmers coming forward expressing an interest in the project and engaging with the Agricultural advisory officer indicates increased capacity and interest in the project.

The planned exit strategy is still valid. We will ensure a sustained legacy by training local staff in the Department of Agriculture how to use the soil maps in conjunction with their customers i.e. the end users. Staff in SAERI and in the DoA will be fully conversant with the project methodology and outcomes. This will enable continued maintenance of the online mapping tool beyond the life of the project.
Furthermore, legacy outside of the Falklands within UK Government planning will be achieved through the work pursued by the UKCEH project partner as described in section 4.

11. Darwin identity

The Darwin Initiative funding was recognised in every communication and public engagement event (workshop, Farmer's Week etc.). The logo was displayed in presentations and advertisements; the Darwin Initiative was recognised in press articles and the funding through the UK government was explained in presentations and meetings with stakeholders.

The soil mapping project was always presented as a distinct project with a clear identity attached to the Darwin Initiative as the funding donor. The Darwin Initiative funding programme was known to some people as there have been previous Darwin Projects on the Falklands; however, the project's outreach work has increased public awareness of the Darwin Initiative, particularly with the farming and land-owning community. This is supported by section 2 (stakeholder engagement) and section 10 (sustainability and legacy).

The logo was displayed in the following outreach:

- The fieldwork vehicle has the Darwin logo displayed on both sides of the car (Figure 23).
- All above-mentioned presentations and posters (section 2) displayed the Darwin logo; examples are shown in Figures 4, 5, 9, 10; see also CIEEM presentation and stakeholder workshop report.
- Advertisement for stakeholder events included the logos (Figure 6).
- Blogs from project partners on the SAERI website (Blogs 1 and 2).

The Darwin Initiative was mentioned in the following outreach:

- Several Facebook posts and tweets in which the Darwin Initiative was tagged, examples are presented in Figures 24 and 25. SAERI currently have over 2,000 followers on Twitter (compared to 1,640 last year); the Facebook posts reached up to 1,000 people.
- One radio interview on the project's gas flux study (17 July 2019) and one radio piece on World Soil Day (5 December 2019, see latest news).

SAERI now have a member of staff with direct responsibility for communication and social media. This has enhanced SAERI's outreach considerably over the last six months and therefore also benefitted promotion of the Darwin Initiative.

Figure 23: Photos taken during the November/December 2019 fieldwork season showing the display of the Darwin logo on both sides of the car.

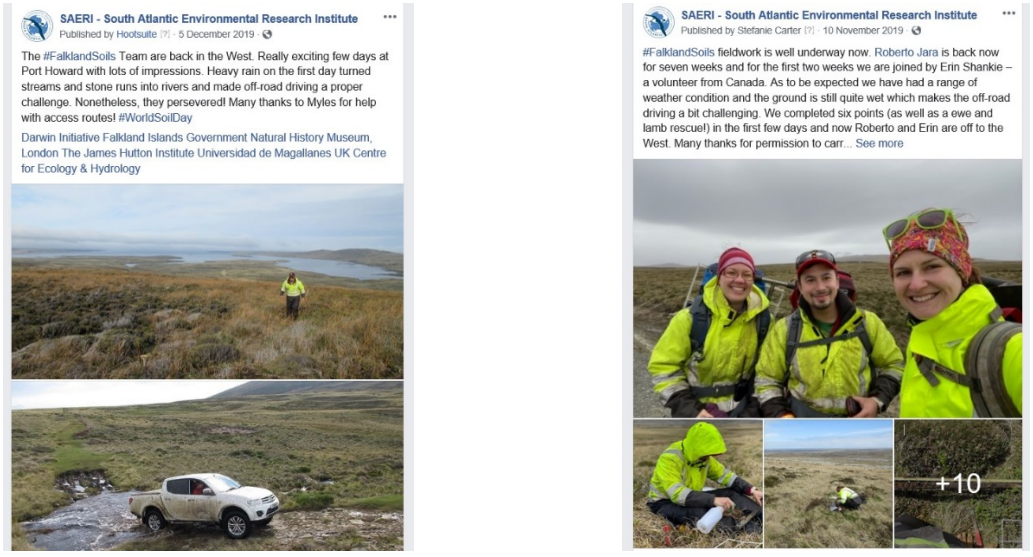


Figure 24: Examples of Facebook posts, which show how the Darwin Initiative is tagged.

Figure 25: Examples of tweets, which show how the Darwin Initiative is tagged.

12. Safeguarding

SAERI has a draft safeguarding policy that is currently under review, part of the review includes ascertaining its compatibility with in-territory government safe-guarding policies. Once finalised it will be presented to our Board for sign off. In the interim period, SAERI's projects apply the safeguarding principles as described. SAERI also has a whistle blowing policy which protects whistle blowers from reprisals and includes clear processes for dealing with concerns raised. During the reporting period of this project, there have been no actions that relate to this policy.

13. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2019 – 31 March 2020)

Project spend (indicative) in this financial year	2019/20 D+ Grant (£)	2019/20 Total actual D+ Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items				
Others (Please specify)				
TOTAL				

* Note there is a £36.48 overspend which is being absorbed by SAERI

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2019-2020 – if applicable

(All indicators and activities relevant for this reporting year are in black font; all remaining ones are in grey font)

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
Impact: Science-based evidence on soils, peatlands and erosion extent/risk will allow policy makers, conservationists and land managers/owners to implement priority actions mentioned in the national climate change mitigation action plan.		The impact of the soil maps will be determined by future implementation into policy and land management decisions. In order to achieve this, all relevant stakeholders need to be aware of their existence and potential. Stakeholder engagement in the host territory as well as on a global level was particularly productive in this project year which has raised the project's profile significantly (outlined in sections 4 and 10) and will ensure the desired impact will be delivered	
Outcome: Improved evidence-base for mitigating climate change through new decision support tools: online maps and database of soil types, peatlands and erosion extent/risk integrated with physical, chemical and microbiological analyses of soils.	0.1 A distribution map of soils, peatlands and erosion extent for the Falkland Islands to fill a knowledge gap and provide information on a fundamental natural resource which needs sustainable management. 0.2 An online tool for interpreting the chemical and microbiological aspects of the soils to help habitat restoration and land managers to more effectively mitigate against erosion, soil degradation and carbon loss.	0.1 The fieldwork and chemical and physical analyses have been completed; preliminary maps have been issued and added to the webGIS, the PostgreSQL database contains all data from the first field season, stakeholder engagement was carried out locally and globally. 0.2 Stakeholder engagement revealed that an offline version of the maps is desired, which will be delivered alongside the webGIS.	Creation of final maps, completion of webGIS, delivery of offline maps, completion of postgreSQL data base, completion of microbiology lab work, addition of microbiology results to the webGIS.
Output 1. **Project Management structure, monitoring, evaluation and communications tools established**	1.1 A Memorandum of Understanding (MoU) agreed and signed by all partners by May 2018 1.2 Project Manager recruited by August 2018	1.1 Six out of seven parties have signed the MoU; signed version are available on the project website. Indicator is appropriate. 1.2 n/a in this reporting period, was completed in project year 1, indicator is appropriate.	

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
	1.3 A Project Management Group (PMG) meeting held every 3 months starting May 2018 1.4 6-monthly stakeholder engagement will be maintained through workshops and 1-1 contact during the summer and through a presentation and 1-1 meetings during the annual Farmer's Week in July 1.5 At least 1 project webpage created by April 2018, and at least 1 update to the page made every 3 months. 1.6 Monitoring and evaluation plan created by October 2018 1.7 Final project report produced by July 2020	1.3 Quarterly PMG meetings were held in April, July, October 2019 and February 2020. The meeting minutes are available on the project website. Indicator is appropriate. 1.4 The 6-monthly stakeholder contact was maintained as planned. See section two – local stakeholders – and the workshop report. Indicator is appropriate. 1.5 The project website is updated regularly through the latest news and the document download area. Indicator is appropriate. 1.6 n/a in this reporting period, was completed in project year 1, indicator is appropriate. 1.7 n/a in this reporting period. Will be carried out in project year 3 - indicator is appropriate.	
Activity 1.1 Write the MoU, circulate it among the project partners and have it signed		Two additional project partners signed the MoU; one project partners has not signed and is unlikely to sign before project completion.	n/a
Activity 1.2 Prepare the contract for the PM role, advertise the job, recruit and have the contract signed by August 2018		Completed in project year 1.	n/a
Activity 1.3 Arrange quarterly PMG meetings		Completed.	Quarterly meeting schedule will be maintained.
Activity 1.4 Arrange annual workshops and an annual presentation and offer the opportunity for 6-monthly 1-1 meetings every six months		6-monthly stakeholder contact has been maintained through Farmer's Week and stakeholder workshops (see section 2 – local stakeholders).	One further stakeholder event during Farmer's Week in July 2020.
Activity 1.5 Set up the project webpage at the main SAERI website and keep it updated once every three months		Completed.	Regular updates will be made.
Activity 1.6 Write the monitoring and evaluation plan by October 2018		Completed in project year 1.	n/a

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
Activity 1.7 Write and submit the final project report by July 2020 and prepare scientific papers by July 2020		Planned for completion in project year 3.	Write final report and draft scientific papers.
Output 2. WP1: National Soil Map, peatland distribution and soil erosion extent/risk (scale 1:250,000)	2.1 Meeting in the UK (Cambridge – British Antarctic Survey - BAS) amongst overseas partners (UMAG via Skype) to define the strategy for the soil survey by May 2018	2.1 n/a in this reporting period, was completed in project year 1, indicator is appropriate.	
	2.2 Desk study for assessing Satellite imagery availability and identification of digital soil mapping methods by June 2018	2.2 n/a in this reporting period, was completed in project year 1, indicator is appropriate.	
	2.3 Remote Sensing analyses and first soil map by October 2018 to be used by surveyors	2.3 n/a in this reporting period, was completed in project year 1, indicator is appropriate.	
	2.4 Iteration of Remote Sensing analyses using data from soil campaign to originate new soil, peatlands and soil erosion (extent/risk) maps by April 2019	2.4 A first set of maps was issued in April 2019, made available to project partners and added to the project webGIS (Figure 22). These were refined by the addition of chemical data and soil class from the first field season and new maps were issued in January 2020 (Figure 13). The project partner's progress report is available here. Indicator is appropriate.	
	2.5 Soil survey methodology ready by October 2018	2.5 n/a in this reporting period, was completed in project year 1, indicator is appropriate.	
	2.6 Soil surveyor is identified and will participate to the meeting in Cambridge (2.1) to plan the soil campaign methodology	2.6 n/a in this reporting period, was completed in project year 1, indicator is appropriate.	
	2.7 Soil Campaign to be conducted in November 2018, February and November 2019.	2.7 The final fieldwork campaign was conducted as planned, all fieldwork was completed by February 2020, the fieldwork report is available here. Indicator is appropriate.	
	2.8 Desk-based analysis of soil data collected in the Falklands following each soil sampling campaign	2.8 See indicator 2.4. Indicator is appropriate.	
	2.9 Remote sensing analyses consisting in iterations of soil/peatlands and erosion risk maps on the basis of the data coming from soil campaigns	2.9 n/a in this reporting period. Will be carried out in project year 3 - indicator is appropriate.	

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
	and laboratory analyses (completion the first quarter of year 3)		
Activity 2.1 Recruit the soil surveyor and define the date and meet in Cambridge to draw an action plan for the desk-based data analyses, the soil campaign and laboratory works (in London and Falklands)		Completed in project year 1.	n/a
Activity 2.2 Acquire necessary field equipment and ship it to the Falklands if not bought on the islands		Completed in project year 1.	n/a
Activity 2.3 Plan soil campaign in the Falkland Islands and liaise with SAERI logistics officer for the preparation of the fieldwork on farms and in Stanley		Completed in project year 1.	n/a
Activity 2.4 Identify suitable satellite imagery (Sentinel 2) across years and seasons and source other datasets and data sources (Google Earth) which can contribute to the identification of soils, peatlands and areas affected by erosion. Investigate and decide which Digital Soil Mapping methods are the most appropriate for the Falkland Islands. Prepare a report.		Completed in project year 1.	n/a
Activity 2.5 Carry out the pre-processing and processing of the identified satellite imagery and incorporate the other ancillary data. Issue the first soil map by the end of October 2018 as it will be used by surveyors in the soil campaign		Completed in project year 1.	n/a
Activity 2.6 Prepare new versions of the maps (soil/peatlands/erosion) on the basis of the ground-truthed points collected by the soil surveyors. Make the maps available to the stakeholders by end of April 2019		Completed.	n/a
Activity 2.7 Write the soil survey methodology to be followed during the soil campaign and make it available online		Completed in project year 1.	n/a
Activity 2.8 Carry out the soil campaign in the Falkland Islands and write a short fieldwork report at the end of each campaign		Completed.	n/a
Activity 2.9 Process and analyse the data collected during the soil campaign and make them available to the other project partners. The activity will take place between each campaign.		Completed.	n/a
Activity 2.10 Combine ancillary data (elevation, habitat and weather) and soil physical properties to estimate erosion risk and generate a map		Planned for completion in project year 3.	Create erosion risk map.

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
Activity 2.11 Remote sensing analyses continue to be updated and iterated in order to include data coming from the soil campaign. The final maps of soil, peatlands, erosion extent and risk are delivered to the stakeholders by June 2020		Completed.	Final reiteration of soil model and creation of final maps.
Output 3. WP2: Assessment of the sustainability of soil management practices and of soils physical, chemical and microbiological properties	3.1 Chemical analyses of soil sampled during the fieldwork (November 2018, February and November 2019) 3.2 DNA sequencing of soil samples collected at locations chosen by stakeholders and agricultural advisors 3.3 Map the results against other data collected or used by the project to identify patterns in the soil physical, chemical and biological properties across the islands 3.4 Identify a sustainable and long-term manageable monitoring programme for assessing soil health by the end of July 2020	3.1 The lab analyses of the soil samples collected in the final fieldwork campaign was completed as planned (Figure 16) and the data were uploaded to the google drive (Figure 14). Indicator is appropriate. 3.2 The methodology for the microbiology has been updated and made available on the project website and analyses have commenced. The work could not be completed as scheduled which is explained by NHM in the following statement *"Reasons for the delays were additional PCR tests to confirm that DNA yields were of sufficient quality and quantity to generate PCR products from all types of soils before up scaling the number of extractions per batch. Further delays are due to COVID-19. In accordance with UK government regulation, the Museum asked all staff including scientists like me to get ready for working at home from beginning of March which meant that I could not continue with the practical laboratory work for the project. The formal announcement of the closure of the Museum was on the 17 March with a subsequent UK-wide lock down. I will continue with the practical work for the project as soon as i will be able to work at the museum again to deliver the sequencing outputs."* 3.3 n/a in this reporting period, maps have not been created yet. Will be carried out in project year 3 - indicator is appropriate. 3.4 n/a in this reporting period. Will be carried out in project year 3 - indicator is appropriate.	
Activity 3.1 Check which equipment is needed to carry out laboratory analyses in the Falklands and subsequently buy and ship what is missing		Completed in project year 1.	n/a
Activity 3.2 Identify with stakeholders, soil surveyors and agricultural advisors how many soil samples should be collected for DNA sequencing and from which areas		Completed in project year 1.	n/a

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
Activity 3.3 Adopt current accepted metrics and standards to measure soil health and DNA sequencing. Write a report and make it available online		Completed.	n/a
Activity 3.4 Define with the soil surveyors and the laboratory technician the standard methods of soil collection and storage. If necessary run a training course		Completed in project year 1.	n/a
Activity 3.5 Assess the sustainability of soil management practices by sequencing analysis for soil microorganisms carried out at the Life Sciences Department, NHM, London		Completion delayed.	Complete sequencing analysis, write a report and a scientific paper.
Activity 3.6 Provide interpretation of the results from analyses so that they can be explained in a way that is accessible to local stakeholders and all users of the interpretative soil database tool		Planned for completion in project year 3.	Write an interpretation guide for local stakeholders.
Activity 3.7 Carry out the chemical analyses of soils sampled during the campaigns. The lab analyses will take place in the Falklands.		Completed.	n/a
Activity 3.8 Identify and document which laboratory analyses approaches, used throughout the project, can support a long-term monitoring program for quantifying chemical and biological soil properties and for assessing soil health.		Planned for completion in project year 3	Write report in project year 3
Activity 3.9 Pull out the main outcomes from the laboratory analyses (chemical and biological) and plan for publishing them on a scientific paper.		Planned for completion in project year 3	Write scientific paper in project year 3
Output 4. WP3: Development of soil spatial database and interactive tool for interpreting and describing soils properties and health, displaying soil erosion risk on selected farms. The tool supports stakeholders' actions for mitigating with climate change effects	4.1 Meeting with stakeholders to present examples of designs of the online data system tool and obtain feedback on which format works better. Updates on the development of the tool will be provided at each PSG meeting. 4.2 Data sharing procedures to allow access to the data for all project participants. By June 2018 4.3 SAERI server to be set up in order to store database in PostgreSQL and datasets collected throughout the project by June 2018	4.1 The interactive tool delivered to local stakeholders was discussed during stakeholder workshops, pdf maps were suggested and this idea has been promoted in the follow-up stakeholder engagement (workshop report). 4.2 n/a in this reporting period, was completed in year 1, indicator is appropriate. 4.3 n/a in this reporting period, was completed in year 1, indicator is appropriate. 4.4 n/a in this reporting period, was completed in year 1, indicator is appropriate.	

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
	4.4 Online interactive soil database on soil properties and erosion risk by July 2020 4.5 Database of the national soils, peatlands and eroded areas and erosion risk in PostgreSQL (open source database engine) accessible by Stakeholders and project partners. Continuous work from November 2018 until July 2020 4.6 Preparation and publication of webGIS services to make results available to the wider public by July 2020	4.5 The spatial database in PostgreSQL was updated with the data from the first fieldwork season (Figure 17). Indicator is appropriate. 4.6 All the latest maps have been uploaded to the preliminary webGIS (Figure 17). Indicator is appropriate.	
4.1 Liaise with other project participant to ensure that the data management plan is adopted, filled in and kept up-to-date. Include the data management plan to the report to be submitted to the funding organisation		Completed.	Update the data management plan if necessary.
4.2 Talk to project partners to understand and define how they need to access and share the data collected and analysed and in which form. Write the methodology and make it available online.		Completed in project year 1.	n/a
4.3 Design the spatial database for the national soil map and the interpretative tool on soil properties, carbon storage and erosion risk in PostgreSQL and link it to QGIS and a to the project based webGIS service		Completed.	Update the data base and webGIS with all the data and maps.
4.4 Check that data are documented, open access, quality checked, stored and backed-up in the secure server at the local data centre in the Falkland Islands and on a cloud server for the overseas project partners		Completed.	Continue with data quality and storage checks.
4.5 Engage the stakeholders to identify which information requirements are needed for the online and freely available interpretative soil and erosion risk tool. Write a short report to describe the outcomes of the stakeholders engagement		Completed.	n/a
4.6 Use stakeholders' feedbacks to ensure that the interpretative tool can be simply accessed and understandable by them and easily managed by SAERI data manager. Write a short report to describe the various steps made to generate the interactive tool		Completed.	n/a

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
4.7 Test and assess the interactive tool on farmer attitude and economic performance of the farms. Use the results in a feedback loop to modify the tool and make it more efficient and valuable and more able to be adopted into policy decisions		Planned for completion in project year 3	Modify the tool if stakeholder feedback suggests this.
4.8 Publish the final maps online through webGIS service		Planned for completion in project year 3	Publish maps at the end of the project
4.9 Publish the interactive tool online at the Department of Agriculture webpage		Planned for completion in project year 3	Publish interactive tool at the end of the project
Output 5. Etc.	5.1 At maximum of 8 workshops (split into 4 in West and 4 in East Falkland) will be run on farms and in Stanley to landowners and to the public to describe and explain in simple words the use of the tools employed throughout the project and to ensure the people are informed and can appreciate their practical applications to land management. The workshops will be running in the last quarter of year 2 5.2 At least two local stakeholders trained in fieldwork to learn what the soil survey is about and how a better knowledge of the soils and their properties helps in managing this natural resource in relation to farm business and conservation plans. Monthly fieldwork campaigns will occur 3 times in spring and summer 2018/2019 and in spring 2019 5.3 Training on gas flux measurements for local scientists and interested stakeholders so that monitoring work can be continued.	5.1 Two workshops were held in February 2019 that explained the project's background of soil modelling and field work and illustrated with a case study how the final maps can be utilised for land management (see workshop report and slides examples in Annex 4). Indicator is appropriate. 5.2 n/a in this reporting period, was completed in project year 1, indicator is appropriate. 5.3 n/a in this reporting period. Will be carried out in project year 3 - indicator is appropriate.	

Project summary	Measurable Indicators	Progress and Achievements April 2019 - March 2020	Actions required/planned for next period
5.1 Run 2 workshops on farms and in Stanley (one each) on soil health and training agricultural advisors and habitat restoration officer on how to collect soil samples for future chemical/biological analyses and for soil properties monitoring		Completed.	A final presentation will be delivered at the end of the project locally and opportunities will be given for local landowners to ask questions on these subject matters.
5.2 Prepare 2 workshops on farms and in Stanley (one each) on what the Earth Observation techniques can tell about soils, erosion and peatlands.		Completed.	
5.3 Deliver 2 workshops on farms and in Stanley on how to use the interactive tool, how to keep it up-to-date and how to monitor soil health/erosion/greenhouse gases emission in the long term		Completed.	
5.4 Deliver 2 workshops on farms and in Stanley (one each) to describe the soils of the Falklands and how the soil campaign took place		Completed.	
5.5 Present the results at the annual winter meeting for rural landowners - Farmers' Week		Completed.	Deliver final presentation at the end of the project.
5.6 Promote the project by allowing volunteers, including interested high school students, to join the PM and the project partners on fieldwork and laboratory analyses (in the Falklands)		Completed.	Most of the practical work is completed now; if more opportunities arise, this will be communicated locally.
5.7 Promote the Falkland Islands soil work to other UKOTs		Completed.	Promote the project to UKOTs.

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed) - if applicable

N.B. if your application's logframe is presented in a different format in your application, please transpose into the below template. Please feel free to contact Darwin-Projects@ltsi.co.uk if you have any questions regarding this.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: Science-based evidence on soils, peatlands and erosion extent/risk will allow policy makers, conservationists and land managers/owners to implement priority actions mentioned in the national climate change mitigation action plan.			
Outcome: Improved evidence-base for mitigating climate change through new decision support tools: online maps and database of soil types, peatlands and erosion extent/risk integrated with physical, chemical and microbiological analyses of soils.	0.1 A distribution map of soils, peatlands and erosion extent for the Falkland Islands to fill a knowledge gap and provide information on a fundamental natural resource which needs sustainable management. 0.2 An online tool for interpreting the chemical and microbiological aspects of the soils to help habitat restoration and land managers to more effectively mitigate against erosion, soil degradation and carbon loss.	0.1. A tailored WebGIS portal for accessing the distribution map and all project data will be designed and published online. The metadata catalogue (Falkland Islands IMS-GIS data centre) will host the metadata of the data gathered throughout the project. 0.2 The tool for interpreting the national soils, their characteristics and the erosion risk will be published on FIG Department of Agriculture (DoA) webpage.	0.1 SAERI continue to retain relevant skilled staff and the Falkland Islands IMS-GIS data centre will be sustained by the government in the future years 0.2 The tool for monitoring erosion risk will be simple enough to be maintained in the long term by the stakeholders
Outputs: **1**. Project Management structure, monitoring, evaluation and communications tools established	1.1 A Memorandum of Understanding (MoU) agreed and signed by all partners by May 2018 1.2 Project Manager recruited by August 2018 1.3 A Project Management Group (PMG) meeting held every 3 months starting May 2018 1.4 6-monthly stakeholder engagement will be maintained through workshops and 1-1 contact during the summer and through a presentation and 1-1 meetings during the annual Farmer's Week in July	1.1 MoU signed by all parties 1.2 Project Manager employment contract signed 1.3 PMG meeting notes available online 1.4 Workshop meeting notes available online, evidence for Farmer's Week presentation submitted through Darwin Annual Report 1.5 Project webpage available for viewing online 1.6 Monitoring and evaluation plan available online 1.7 Final project report available online.	1.1 Project partners agree to sign the MoU 1.2 PM with the relevant skills is able to be recruited. 1.3 and 1.4 PMG can meet without delays; stakeholder are willing and able to participate in workshops and meetings. 1.5 PM will be trained on how to use and update the project webpage on SAERI website 1.6 The monitoring and evaluation plan has been written and implemented

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	1.5 At least 1 project webpage created by April 2018, and at least 1 update to the page made every 3 months. 1.6 Monitoring and evaluation plan created by October 2018 1.7 Final project report produced by July 2020		1.7 PM to be on time with his/her tasks and able to write the final report
2. WP1: National Soil Map, peatland distribution and soil erosion extent/risk (scale 1:250,000)	2.1 Meeting in the UK (Cambridge – British Antarctic Survey - BAS) amongst overseas partners (UMAG via Skype) to define the strategy for the soil survey by May 2018 2.2 Desk study for assessing Satellite imagery availability and identification of digital soil mapping methods by June 2018 2.3 Remote Sensing analyses and first soil map by October 2018 to be used by surveyors 2.4 Iteration of Remote Sensing analyses using data from soil campaign to originate new soil, peatlands and soil erosion (extent/risk) maps by April 2019 2.5 Soil survey methodology ready by October 2018 2.6 Soil surveyor is identified and will participate to the meeting in Cambridge (2.1) to plan the soil campaign methodology 2.7 Soil Campaign to be conducted in November 2018, February and November 2019. 2.8 Desk-based analysis of soil data collected in the Falklands following each soil sampling campaign 2.9 Remote sensing analyses consisting in iterations of soil/peatlands and erosion risk maps on the basis of	2.1 Meeting notes and survey strategy design available online. Data Management Plan initialised 2.2 Desk study report available online 2.3 Processed satellite imagery available online through the project specific webGIS service and by November 2018. Soil map given to the surveyors for ground truthing. 2.4 First validated soil, peatlands and erosion extent/risk maps available to other project participants and stakeholders by April 2019. Remote sensing interpretation methods documented and shared amongst project partners to allow evaluation of derived maps 2.5 Publication online of the soil survey methodology 2.6 Soil surveyor contract of employment 2.7 Brief soil survey reports generated at the end of each soil campaign 2.8 Soil type descriptions available as GIS layer and tables (excel or comma delimited files) at the beginning of each new campaign 2.9 Maps of soil, peatlands and erosion extent/risk published online through the webGIS service and stored on the Falkland Islands data centre repository.	2.1 All overseas project partners available for the meeting and BAS agreeing to provide a meeting room 2.2 Availability of cloud-free Sentinel 2 imagery across multiple years (from 2015) and for more than one season. If Sentinel 2 is not available, then Landsat will be the substitute for analyses 2.3 Images will have been processed and the model shown to be successful 2.4 Soil surveyors were able to provide ground truthing points and soil descriptions for remote sensing analyses. Digital Soil model is proving good. 2.5 There is good collaboration between project partners and the PM is already in post 2.6 Experienced soil surveyor is available to take the job 2.7. Good weather to allow fieldwork during the various soil campaigns in order to provide ground truthing points for remote sensing analyses. It is assumed that there will not be problems with the logistics (e.g. flight disruptions and lack of accommodations in rural locations) All soil surveyors will be fit and healthy enough to carry out fieldwork for the planned periods

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	the data coming from soil campaigns and laboratory analyses (completion the first quarter of year 3)	All datasets will have been documented with standard metadata form and metadata logged in IMS-GIS data centre metadata catalogue online by July2020	2.8 At the end of each soil campaign the majority of the data are already in digital form to allow time for soil descriptions between consecutive campaigns 2.9 Soil survey campaigns feed the model used by the remote sensing analyses with useful data. No assumption on the data centre as it exists already and provides the type of services needed to publishing data.
3. WP2: Assessment of the sustainability of soil management practices and of soils physical, chemical and microbiological properties	3.1 Chemical analyses of soil sampled during the fieldwork (November 2018, February and November 2019) 3.2 DNA sequencing of soil samples collected at locations chosen by stakeholders and agricultural advisors 3.3 Map the results against other data collected or used by the project to identify patterns in the soil physical, chemical and biological properties across the islands 3.4 Identify a sustainable and long term manageable monitoring programme for assessing soil health by the end of July 2020	3.1 Report on methods, types and results from the chemical properties are analysed and published on a pdf and csv file. 3.2 Report on methods, and results from DNA sequencing analyses will be available as pdf file and on a csv file 3.3 Interpretation of the results (physical, chemical and biological) for each sampled location and Extrapolation to the entire islands. Data to be added to the interactive soil properties and erosion risk tool and scientific evaluation published in open access international journal. 3.4 Documentation of approaches used for sample analysis, for comparison/standardisation and to facilitate project reporting and publication development	3.1 Soil samples are collected according to standards and received by the laboratory technician in a well preserved way. 3.2 No delays in shipping equipment for laboratory analyses 3.3 The laboratory tests were successful and the interactive tool is ready 3.4 The results obtained from the laboratory analyses will be available for publication
4. WP3: Development of soil spatial database and interactive tool for interpreting and describing soils properties and health, displaying soil erosion risk on selected farms. The tool supports stakeholders' actions for mitigating with climate change effects	4.1 Meeting with stakeholders to present examples of designs of the online data system tool and obtain feedback on which format works better. Updates on the development of the tool will be provided at each PSG meeting.	4.1 Summary document from meeting with stakeholders to decide how the interactive tool should look and what it should contain in order to be useful and usable. To be updated after every meeting (at least every 6 months) by reporting on interactions with	4.1 All stakeholders are available for the meeting and show interest in helping in outlining and testing the interactive tool 4.2 and 4.3 no assumption as the data manager has been working for the last 4 years at SAERI using the server and creating databases.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	4.2 Data sharing procedures to allow access to the data for all project participants. By June 2018 4.3 SAERI server to be set up in order to store database in PostgreSQL and datasets collected throughout the project by June 2018 4.4 Online interactive soil database on soil properties and erosion risk by July 2020 4.5 Database of the national soils, peatlands and eroded areas and erosion risk in PostgreSQL (open source database engine) accessible by Stakeholders and project partners. Continuous work from November 2018 until July 2020 4.6 Preparation and publication of webGIS services to make results available to the wider public by July 2020	stakeholders throughout online tool development, to provide evidence of feedback and tool design adjustments 4.2 Report on data sharing agreement Published online 4.3 Ensure that the server in SAERI has prepared for the new database. 4.4 Delivery of the tool and publication online. Additionally, a step by step guide on how the interactive tool works and instruction on its long term maintenance will be provided. 4.5 Data on national soils/peatland distribution, carbon storage, soil erosion extent and risk layers which populate the database are made available to the stakeholders and project partners 4.6 Publication of the maps through Project specific webGIS service	4.4 Free or low charge internet connection for the interactive soil properties and erosion risk tool (to be negotiated with SURE, the local telecommunication provider) 4.5 the server used for storing the database is accessible to authorised users (stakeholders and project partners) 4.6 the webGIS service will be ready by the last quarter of year 2
5. WP4: Knowledge transfer workshops and training courses	5.1 At maximum of 8 workshops (split into 4 in West and 4 in East Falkland) will be run on farms and in Stanley to landowners and to the public to describe and explain in simple words the use of the tools employed throughout the project and to ensure the people are informed and can appreciate their practical applications to land management. The workshops will be running in the last quarter of year 2 5.2 At least two local stakeholders trained in fieldwork to learn what the soil survey is about and how a better knowledge of the soils and their properties helps in managing this	5.1 Workshop reports will be available online and the workshop will be followed up by articles in the local newspaper 5.2 Stakeholder feedback forms completed. 5.3 Manual for gas flux measurements available online	5.1, 5.2, 5.3, 5.4 Interest from stakeholders, above all landowners 5.1 Venues for hosting the workshops in rural areas will be available and people can travel to them without disruptions 5.2 Local stakeholders' available time and scheduled fieldwork coincide 5.3 Weather conditions allow gas flux measurements to be taken.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	natural resource in relation to farm business and conservation plans. Monthly fieldwork campaigns will occur 3 times in spring and summer 2018/2019 and in spring 2019 5.3 Training on gas flux measurements for local scientists and interested stakeholders so that monitoring work can be continued.		

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

Output 1 - Project Management Structure

1.1 Write the MoU, circulate it among the project partners and have it signed
1.2 Prepare the contract for the PM role, advertise the job, recruit and have the contract signed by August 2018
1.3 Arrange quarterly PMG meetings
1.4 Arrange annual workshops and an annual presentation and offer the opportunity for 6-monthly 1-1 meetings every six months
1.5 Set up the project webpage at the main SAERI website and keep it updated once every three months
1.6 Write the monitoring and evaluation plan by October 2018
1.7 Write and submit the final project report by July 2020 and prepare scientific papers by July 2020

Output 2 - WP 1: National Soil Map, peatland distribution and soil erosion extent/risk

2.1 Recruit the soil surveyor and define the date and meet in Cambridge to draw an action plan for the desk-based data analyses, the soil campaign and laboratory works (in London and Falklands)
2.2 Acquire necessary field equipment and ship it to the Falklands if not bought on the islands
2.3 Plan soil campaign in the Falkland Islands and liaise with SAERI logistics officer for the preparation of the fieldwork on farms and in Stanley
2.4 Identify suitable satellite imagery (Sentinel 2) across years and seasons and source other datasets and data sources (Google Earth) which can contribute to the identification of soils, peatlands and areas affected by erosion. Investigate and decide which Digital Soil Mapping methods are the most appropriate for the Falkland Islands. Prepare a report
2.5 Carry out the pre-processing and processing of the identified satellite imagery and incorporate the other ancillary data. Issue the first soil map by the end of October 2018
as it will be used by surveyors in the soil campaign
2.6 Prepare new versions of the maps (soil/peatlands/erosion) on the basis of the ground-truthed points collected by the soil surveyors. Make the maps available to the stakeholders by end of April 2019
2.7 Write the soil survey methodology to be followed during the soil campaign and make it available online
2.8 Carry out the soil campaign in the Falkland Islands and write a short fieldwork report at the end of each campaign

Project summary	Measurable Indicators	Means of verification	Important Assumptions
2.9 Process and analyse the data collected during the soil campaign and make them available to the other project partners. The activity will take place between each campaign. 2.10 Combine ancillary data (elevation, habitat and weather) and soil physical properties to estimate erosion risk and generate a map 2.11 Remote sensing analyses continue to be updated and iterated in order to include data coming from then soil campaign. The final maps of soil, peatlands, erosion extent and risk are delivered to the stakeholders by June 2020 <u>Output 3 - WP2: Assessment of the sustainability of soil management practices and of soils physical, chemical and microbiological properties</u> 3.1 Check which equipment is needed to carry out laboratory analyses in the Falklands and subsequently buy and ship what is missing 3.2 Identify with stakeholders, soil surveyors and agricultural advisors how many soil samples should be collected for DNA sequencing and from which areas 3.3 Adopt current accepted metrics and standards to measure soil health and DNA sequencing. Write a report and make it available online 3.4 Define with the soil surveyors and the laboratory technician the standard methods of soil collection and storage. If necessary run a training course 3.5 Assess the sustainability of soil management practices by sequencing analysis for soil microorganisms carried out at the Life Sciences Department, NHM, London 3.6 Provide interpretation of the results from analyses so that they can be explained in a way that is accessible to local stakeholders and all users of the interpretative soil database tool 3.7 Carry out the chemical analyses of soils sampled during the campaigns. The lab analyses will take place in the Falklands. 3.8 Identify and document which laboratory analyses approaches, used throughout the project, can support a long term monitoring program for quantifying chemical and biological soil properties and for assessing soil health 3.9 Pull out the main outcomes from the laboratory analyses (chemical and biological) and plan for publishing them on a scientific paper <u>Output 4 - WP3: Development of soil spatial database and interactive tool</u> 4.1 Liaise with other project participant to ensure that the data management plan is adopted, filled in and kept up-to-date. Include the data management plan to the report to be submitted to the funding organisation 4.2 Talk to project partners to understand and define how they need to access and share the data collected and analysed and in which form. Write the methodology and make it available online. 4.3 Design the spatial database for the national soil map and the interpretative tool on soil properties, carbon storage and erosion risk in PostgreSQL and link it to QGIS and a to the project based webGIS service 4.4 Check that data are documented, open access, quality checked, stored and backed-up in the secure server at the local data centre in the Falkland Islands and on a cloud server for the overseas project partners 4.5 Engage the stakeholders to identify which information requirements are needed for the online and freely available interpretative soil and erosion risk tool. Write a short report to describe the outcomes of the stakeholders engagement 4.6 Use stakeholders' feedbacks to ensure that the interpretative tool can be simply accessed and understandable by them and easily managed by SAERI data manager. Write a short report to describe the various steps made to generate the interactive tool 4.7 Test and assess the interactive tool on farmer attitude and economic performance of the farms. Use the results in a feedback loop to modify the tool and make it more efficient and valuable and more able to be adopted into policy decisions 4.8 Publish the final maps online through webGIS service 4.9 Publish the interactive tool online at the Department of Agriculture webpage <u>Output 5 – WP 4: Knowledge transfer workshops and training courses</u>			

Project summary	Measurable Indicators	Means of verification	Important Assumptions
5.1 Run 2 workshops on farms and in Stanley (one each) on soil health and training agricultural advisors and habitat restoration officer on how to collect soil samples for future chemical/biological analyses and for soil properties monitoring 5.2 Prepare 2 workshops on farms and in Stanley (one each) on what the Earth Observation techniques can tell about soils, erosion and peatlands. 5.3 Deliver 2 workshops on farms and in Stanley on how to use the interactive tool, how to keep it up-to-date and how to monitor soil health/erosion/greenhouse gases emission in the long term 5.4 Deliver 2 workshops on farms and in Stanley (one each) to describe the soils of the Falklands and how the soil campaign took place 5.5 Present the results at the annual winter meeting for rural landowners - Farmers' Week 5.6 Promote the project by allowing volunteers, including interested high school students, to join the PM and the project partners on fieldwork and laboratory analyses (in the Falklands) 5.7 Promote the Falkland Islands soil work to other UKOTs			

Annex 3 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	