
DPR11S2\1009

Mitigating the impacts of climate change on sea turtle populations

Sea turtles in the Cayman Islands are recovering from over-harvesting but now face numerous threats from climate change, including loss of habitat, increasingly female-biased offspring sex ratios and reduced hatch success from extreme temperatures and inundation. This project aims to assess the impacts of rising temperatures, increased storminess and sea level rise and implement management initiatives to mitigate the impacts. The project will see significant capacity building and outreach using turtles as a flagship for enhanced coastal zone management.

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GMS ORGANISATION

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Section 2 - Title & Summary

Q3. Project Title:

Mitigating the impacts of climate change on sea turtle populations

What was your Stage 1 reference number? e.g. DPR11S1\1123

DPR11S1\1035

Q4. Summary of project

Please provide a brief summary of your project: the problem it is trying to address, its aims, and the key activities you plan to undertake.

Successful Darwin Plus Main projects in Round 11 must demonstrate substantial measurable outcomes in at least one of the themes of Darwin Plus either by the end of the project's implementation or via evidenced mechanisms for post-project delivery.

Preference will be given to discrete projects implementing existing identified environmental solutions on the ground.

The broad themes of Darwin Plus Main are:

- **Biodiversity:** improving and conserving biodiversity, and slowing or reversing biodiversity loss and degradation;
- **Climate change:** responding to, mitigating and adapting to climate change and its effects on the natural environment and local communities;
- **Environmental quality:** improving the condition and protection of the natural environment;
- **Capability and capacity building:** enhancing the capacity within OTs to support the environment in the short- and long-term.

Please write this summary for a non-technical audience.

Sea turtles in the Cayman Islands are recovering from over-harvesting but now face numerous threats from climate change, including loss of habitat, increasingly female-biased offspring sex ratios and reduced hatch success from extreme temperatures and inundation. This project aims to assess the impacts of rising temperatures, increased storminess and sea level rise and implement management initiatives to mitigate the impacts. The project will see significant capacity building and outreach using turtles as a flagship for enhanced coastal zone management.

Section 3 - UKOT(s), Dates & Budget Summary

Q5. UKOT(s)

Which UK Overseas Territory(ies) will your project be working in?

Cayman Islands

* if you have indicated a territory group with an asterisk, please give detail on which territories you are working on here:

No Response

In addition to the UKOTs you have indicated, will your project directly benefit any other Territories or country(ies)?

Yes

Please list below.

The findings and skills gained will be of direct relevance to Anguilla, BVI, Montserrat and TCI as well as Ascension and BIOT.

Q6. Project dates

Start date:

01 April 2023

End date:

31 March 2026

Duration (e.g. 2 years, 3 months):

3 years

Q7. Budget summary

Year:

2023/24

2024/25

2025/26

Total request

Amount:	£108,563.00	£143,324.00	£145,102.00	£
				396,989.00

Q8. Proportion of Darwin Plus budget expected to be expended in UKOTs (%) ■

Q9a. Do you have matched funding arrangements?

Yes

What matched funding arrangements are proposed?

The University of Exeter have confirmed ■ of match funds towards staff time and overheads.

The Cayman Islands Department of Environment have confirmed ■ of matched funds, of which ■ is staff time, ■ is travel and subsistence, ■ is operating costs and ■ is equipment and other costs.

Q9b. Total confirmed & unconfirmed matched funding (£) ■

Q9c. If you have a significant amount of unconfirmed matched funding, please clarify how you fund the project if you don't manage to secure this?

N/A

Section 4 - Problem statement

Q10. Problem the project is trying to address

Please describe the problem your project is trying to address in the UKOTs, relating to at least one of the themes of Darwin Plus.

For example, what are the specific threats to the environment that the project will attempt to address? Why are they relevant, for whom? How did you identify these problems? How will your proposed project help? Please cite the evidence you are using to support your assessment of the problem (references can be listed in your additional attached PDF document).

Since the discovery of the Cayman Islands (Fig1) and their abundant sea turtle populations in 1503, sea turtles have been exploited for their meat. By the 1980s, it was thought the nesting was locally extinct(1), though it was later found to exist at critically low levels(2). The turtle fishery became regulated in 1999, with restrictions strengthened in 2007(3) and there are now only three traditional license holders; though none active since 2010(4). Nesting populations of green (Chelonia mydas) and loggerhead (Caretta caretta) turtles are starting to show signs of recovery with around 270 C. mydas and 250 C. caretta turtle nests now laid each year(3)(Fig2), however, illegal take continues to be a threat to both species, with at least two mature females taken each year(3,4). Hawksbill turtle (Eretmochelys imbricata) nesting remains low (<13 nests/yr)(3).

Sea turtles in the Cayman Islands continue to face threats from loss of habitat as a result of coastal development and the emerging threat of climate change. Recently, CEFAS/UKCEH experts undertook a comprehensive risk assessment of climate risks in the Cayman Islands and listed sea turtles as one of the highest scored biodiversity risk species in this report(6). Past data from tide gauges indicate rising sea levels of up to 2.76mm/year and temperatures over the past 40 years have increased temperature by 0.06°C/yr. There is strong evidence of increased storm intensity(6) which will lead to loss of coastal areas and nesting habitat, skewed sex ratios and a reduced hatch success(6).

Currently, there is very limited understanding of nest temperatures in the Cayman Islands. Prior to 2021, no nest

temperature data were available. However, we now have temperatures from a pilot study of 16 C. mydas nests and have recorded mean incubation temperatures of >31°C, some 2 degrees above the pivotal temperature at which a 1:1 sex ratio is produced and indicative of female biased sex ratios(7).

In addition, more accurate recording of nest inundation data collected in 2021 and 2022 has highlighted increased storminess as a major emerging threat to nests. In 2021, 275 nests were recorded in Grand Cayman and 71 nests were inundated (26% of total nests) and 29 of these were either washed away completely or failed to hatch (10.5% of total nests) due to tropical storm activity. Recently, in 2022, Hurricane Ian generated large swell to Grand Cayman, and although the full impact to nests is not yet known, at least 24 clutches have not survived.

To protect recovering sea turtle populations from these emerging threats, we have four main aims: 1, to create Cayman-specific predictions using mapping and modelling for climate-related nesting beach habitat loss and rising temperature impacts on offspring and hatch success, 2, to produce and implement evidence-based protocols to mitigate climate-related impacts on sea turtles, 3, to develop a policy framework for coastal management and sea turtles for the Cayman Islands and as a model for other OTs, and 4, to increase awareness and share results through local and international outreach programmes.

Section 5 - Environmental Conventions, Treaties and Agreements

Q11. Environmental Conventions, Treaties and Agreements

Please detail how your project will contribute to the aims of the national and/or international agreement(s) your project is targeting. What key OT Government priorities and themes will it address and how? You should also consider local, territory specific agreements and action plans here. Letters of support from UKOT Government partners/stakeholders should also make clear reference to the agreements/action plans your project is contributing towards.

Note: No additional significance will be ascribed for projects that report contributions to more than one agreement.

The project will support the UK and the Cayman Islands Government in meeting several of its commitments outlined in Multilateral Environmental Agreements. The aims are strongly aligned with the Global Goals for Sustainable Development (SDGs), life below water (Goal 14) and Climate Action (Goal 13) as well as the Convention on Biological Diversity's (CBD), core principles; strategic plan for biodiversity (i.e., Aichi Biodiversity targets), and the programme of work on Marine and Coastal Biodiversity. More specifically, a gender-integrated approach to training and data collection will provide skills (Goal 4), promote equal opportunities (Goal 5) and enhance local capacity to ensure robust scientific evidence underpins decision-making processes (Articles 7 and 12, Aichi Target 2, 19). Biodiversity monitoring, threat and priority area mapping will increase understanding of distribution of species and habitats (Goal 14, Aichi Target 1) and contribute to efforts to improve protection and status of marine biological diversity (Articles 10 and 11, Aichi Target 17-19).

In addition, our activities will support actions by implementing agencies to take practicable actions to protect migratory species and regulate international trade of endangered species, thus contributing to obligations under the Convention on International Trade in Endangered Species (CITES; all marine turtle species are listed on Appendix I) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS; all marine turtles are listed on Appendix I).

The project will also assist the Cayman Islands Government in meeting some of its principles outlined in domestic legislation, draft Climate Change Policy (2011) and Environmental Charter (2001). Key project outcomes include modelling future nesting habitat loss, updating the Species Action Plan for Marine Turtles (a component of the overarching Cayman Islands Biodiversity Action Plan) and subsequently developing recommendations for sustainable development alternatives that prioritize coastal protection.

The overarching aim is to ensure biodiversity is protected. By examining the effects of the climate on sea turtles, we will encourage more ambitious climate goals/action for the Cayman Islands, supporting the UN framework convention on climate change (UNFCCC).

Section 6 - Method, Project Stakeholders, Gender, Change Expected,

Pathway to Change & Exit Strategy

Q12. Methodology

Describe the methods and approach you will use to achieve your intended Outcome and contribute towards your Impact. Provide information on:

- How have you reflected on and incorporated evidence and lessons learnt from past and present activities and projects in the design of this project?
- The need for this work and a justification of your proposed approach.
- How you will undertake the work (materials and methods).
- How you will manage the work (roles and responsibilities, project management tools, etc.).

The project will benefit from the methodologies developed and lessons learned from two previous Darwin projects in Ascension Island (DPR8S2/1028) and Montserrat (DPR8S2/1003) in which the University of Exeter (UoE) is investigating sea turtle nesting habitat vulnerabilities to sea level rise (SLR) and climate warming. This includes creation of highly accurate digital terrain maps (DTMs) of nesting beaches, predicting future habitat availability and utilising nest temperature loggers to model offspring sex ratios. DTMs have also previously been used by the UoE team in Cyprus to identify vulnerable areas of beach for clutch relocations(8). We will apply models that have been developed for Ascension to the Cayman Islands, to estimate current and future sex ratios under climate change scenarios that incorporate both temperature change and SLR.

The project also benefits from the experience of the Cayman Islands Department of Environment (CIDoE) and the UoE in delivering multiple successful past Darwin projects, in particular, 14-051 and DPLUS019 which produced the first Biodiversity Action Plan, Species Action Plan for Marine Turtles and Draft Sea Turtle Conservation Plan for the Cayman Islands.

The need for this work has been outlined in the recent draft CEFAS/UKCEH Climate Change Risk Assessment for the Cayman Islands(6) and has become evident from preliminary data collected by CIDoE which indicates elevated nest temperatures and the consequences of storm impacts to nests.

Predicting climate-related impacts on sea turtle nesting beaches and offspring sex ratios

We will use drone-based photogrammetry and differential GPS to create DTMs of nesting beaches. Different SLR and storm surge scenarios will be modelled to identify nesting areas most vulnerable to suffer nest losses(8). Shifts in nesting patterns due to beach loss since monitoring began in 1998, will also be examined using existing GPS data. In addition, at two key locations, models will be repeated after storm surge events to compare the model with ground truth data and the fate of clutches will be overlaid onto these models to confirm areas where clutch success is reduced.

To gain an accurate understanding of hatchling sex ratios in the Cayman Islands, temperature loggers will be placed into *C. caretta* (N=50) and *C. mydas* (N=50) clutches per year throughout the nesting seasons. Variables that may influence incubation temperature will also be measured, including air temperature, distance to water, distance to vegetation, rainfall, egg chamber depth, inundation events and shading. Temperature loggers will also be buried at nest depth in control sites along the beach to identify suitable locations that clutches could be relocated to, should mitigation be required. After signs of hatching or once clutches are overdue, they will be excavated and hatched and unhatched eggs counted to calculate hatching success.

Nest temperatures will be modelled to estimate current offspring sex ratios under different climate change scenarios.

Mitigation

Robust practical adaptation measures will be developed to reduce nest loss and maintain appropriate nest temperatures. Beaches identified as less vulnerable to storm impacts will be listed as suitable locations for relocating nests and success of relocated nests will be measured against those left in-situ. Interventions for mitigation against elevated nest temperatures will be trialled, including investigating shading, presence/planting of native vegetation or water sprinklers. CIDoE nest monitoring protocols will be updated to include continued monitoring of nest temperatures and successful mitigation, should it be required. Management actions for coastal development may include protecting beach vegetation, planting native vegetation, greater setback regulations or beach replenishment¹⁰. Updates to policy documents will be drafted to enable effective reviews of coastal development applications by CIDoE and legally binding recommendations by the National Conservation Council (NCC).

Building capacity

The project will hire one post-doc with expertise in climate-based modelling and mapping. The UoE and CIDoE team will run one workshop each year to share best practice in methodologies. Two field technicians and four field assistants will join the project seasonally to conduct the data collection, along with coordinators from the project partners. The project will favour the hiring and training of local staff to build capacity across the islands. The project leads will have cross-cutting responsibility for overseeing work-streams with the support of senior managers in CIDoE.

Outreach and Engagement

The impact scenarios will be shared in press releases and public meetings and presented to key stakeholders including those listed in logical framework 3.3. School resource packs will be created and field trips conducted for schools. Results will be distributed to the wider international community through social media, conferences, and scientific publications.

Q13. Project Stakeholders

Who are the stakeholders for this project and how have they been consulted (include local or host government support/engagement where relevant)? Briefly describe what support they will provide and how the project will engage with them.

Sea turtles are of cultural importance to the Cayman Islands, as a national emblem, enshrined in the flag and currency. Sea turtles and their coastal habitats also play an important role in attracting tourists to the islands, a major source of income for the islands.

Stakeholders for this project include the National Conservation Council (NCC) board, Central Planning Authority (CPA), Development Control Board, Islands Tourism Association, Beach Front Property Owners Association, CI National Trust, Department of Tourism, the Premier of the Cayman Islands, and the Governor of the Cayman Islands, all of which will be kept informed by means of yearly consultations. Community meetings will be held to keep the general public informed and the scientific community will be engaged by means of publication of the research and presentations at conferences.

CIDoE's director and other staff members sit on the board for the NCC, and therefore meetings are regular occurrence. CIDoE and the Planning Department are also in frequent communication as CIDoE carry out reviews of development applications and can direct conditions on behalf of the NCC in cases where protected species and habitats are involved. These stakeholders will be regularly updated regarding this project.

Q14. Gender equality

All applicants must consider whether and how their project will contribute to reducing inequality between persons of different gender. Explain how your understanding of gender equality within the context your project, and how is it reflected in your plans. Please summarise how your project will contribute to reducing gender inequality. Applicants should, at a minimum, ensure proposals will not increase inequality and are encouraged to design interventions that proactively contribute to increased gender equality.

Gender balance within CIDoE is broadly equal and the project would be delivered by a mixed gender team. The lead partner organisation is subject to the Gender Equality Law, 2011, which seeks to eliminate discrimination in recruitment on the basis of sex, marital status, pregnancy or gender and to promote the payment of equal remuneration to male and female employees who perform work of equal value. When recruiting project staff for enhancing in-country capacity we will be inclusive regardless of gender. Efforts will also be made to ensure all engagement is inclusive and a gender balance is maintained.

The UoE holds an Athena Swan Silver Award, a Race Equality Charter Bronze award, and is an equal opportunities employer. During the appointment of a post-doctoral research fellow for this project the UoE team will ensure a representative sample of applicants are interviewed.

We will ensure that all outreach and education activities consider gender equality in their content and target groups and raise awareness and provide training to staff around gender equality and safeguarding issues.

Q15. Change expected

Detail the expected changes this work will deliver. You should identify what will change and who will benefit a) in the short-term (i.e. during the life of the project) and b) in the long-term (after the project has ended) and the potential to scale the approach. Please describe the changes for the environment and, where relevant, for people in the OTs, and how they are linked.

When talking about how people will benefit, please remember to give details of who will benefit, differences in benefits by gender or other layers of diversity within stakeholders, and the number of beneficiaries expected. The number of communities is insufficient detail – number of households should be the largest unit used.

The study aims to produce quantifiable evidence on climate change impacts to sea turtles in the Cayman Islands within the timescale of the project by utilising existing data and modelling future change.

In the short term, data obtained will be used to predict nesting habitat locations that are deemed at greatest risk of loss due to storms and SLR. This can be used to inform policy and coastal management decisions and to update the current CIDoE protocols on nest protection and relocations. Temperature logger data analysis will give a clearer picture of current and future hatchling sex ratios and help us identify when increasing temperatures will begin to have detrimental impacts on the turtle populations due to excessive feminisation and lowered hatch success. The analysis will determine when/if mitigation is required (such as shading or sprinkling nests or relocating them into section of the beach with lower sand temperatures). Local staff will also be trained to collect standardised climate-change related nest monitoring data to build capacity across the islands.

In the longer term, mitigation techniques can be utilised if necessary, and ongoing monitoring will be required to ensure the success of the outcomes. Results from climate models will be used to enhance more sustainable development across the islands' and to update relevant policy documents. Local staff will be offered opportunities to work on the project, with 4 field assistant positions available each year, in addition to a field lead role. Training will also be provided for student volunteers and our outreach will raise awareness to school children and the general public. The research will be published so the techniques can be utilised across other small island threatened with climate change, including other UK OTs. The project will support the UK Government in meeting several of its commitments outlined in Multilateral Environmental Agreements, including the Convention on International Trade in Endangered Species (CITES), the Convention on Migratory Species (CMS), the Convention on Biological Diversity (CBD), and the Cartagena Convention (SPAW Protocol). The project will also assist the Government of the Cayman Islands in meeting some of its principles outlined in domestic legislation and Environmental Charter.

Q16. Pathway to change

Please outline your project's expected pathway to change. This should be an overview of the overall project logic and outline why and how you expect your Outputs to contribute towards your overall Outcome and, longer term, your expected Impact.

The threat of climate has been identified for small islands and has been highlighted for the low-lying Cayman Islands (Fig3). As the CI Government recently signed the Paris Climate Agreement at COP26, the outcome from this study can help identify key issues and mitigation techniques that are required for the islands to protect beaches and the country's national symbol and species of great historic importance, the sea turtle. By understanding more about coastal habitat loss, we expect to tackle the problem before loss of nesting habitat has a detrimental impact on sea turtle populations. The use of DTMs with animated scenarios of inundation due to SLR is a potent tool in highlighting impacts, making sea turtles a flagship issue for one faced by the human population. By protecting nests from higher incubation temperatures, balanced sex ratios and a greater hatch success could be obtained, ensuring that sea turtle populations continue to increase in numbers in the future.

Q17. Exit Strategy

How will the project reach a sustainable point and continue to deliver benefits post-funding? Will the activities require funding and support from other sources, or will they be mainstreamed in to "business as usual"? How will the required knowledge and skills remain available to sustain the benefits? If relevant, how will your approach be scaled?

CIDoE staff and local research assistants will be trained to collect nest temperature data and imagery to create 3D models

of beaches, and implement management techniques based on updated protocols, such as relocating nests from locations at high risk of erosion/inundation prior to storms and shading nests if the results indicate that the sex ratios are imbalanced or hatch is reduced. CIDoE will continue to fund and manage the sea turtle nest monitoring programme which has been ongoing since 1998.

In addition, the Species Action Plan for Marine Turtles and other relevant policy documents will be updated to include actionable steps to protect sea turtles from loss of habitat and other impacts of climate change, enabling effective reviews of coastal development applications by CIDoE and legally binding recommendations by the Cayman Islands National Conservation Council for the protection of critical sea turtle nesting habitat. Updates to the draft Sea Turtle Conservation Plan will be submitted to Cabinet for their review. This plan would tie into the Climate Change Policy, prioritized by the recently formed Ministry of Sustainability and Resiliency.

Meetings to present the results of the study will be carried out with key government groups, including the Central Planning Authority, so that an understanding of the emerging threats and the action plan is shared with the CI Government. The public, including young people, will be engaged and consulted throughout the project.

If necessary, please provide supporting documentation e.g. maps, diagrams, references etc., as a PDF using the File Upload below:

 [Reference list](#)

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 [Figures 1-3](#)

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Section 7 - Risk Management

Q18. Risk Management

Please outline the 6 key risks to achievement of your Project Outcome and how these risks will be managed and mitigated, referring to the [Risk Guidance](#). This should include at least one Fiduciary, one Safeguarding, and one Delivery Chain Risk.

Projects should also draft their initial risk register using the [Risk Register Template](#) provided, and be prepared to submit this when requested if they are recommended for funding. Do not attach this to your application.

Risk Description	Impact	Prob.	Inherent Risk	Mitigation	Residual Risk
Fiduciary (Financial) Funds are misappropriated	Moderate	Rare	Minor	CIDoE's highly experienced finance manager is responsible for budgetary and financial reporting requirements and will ensure all funds are managed and audited appropriately. UoE has an established due diligence process for working with overseas partners and will ensure there is a legal contract with CIDoE detailing roles and responsibilities.	Minor

Safeguarding Project activities have a negative impact on project staff or focal communities	Major	Rare	Moderate	CIDoE and UoE ensure all staff are aware of the safeguarding policies and will put in place training to ensure any incidences are registered and mitigated. This will be monitored by Project Board. Procedures requiring ethical review will be approved by the UoE Ethics Committee and CIDoE prior to onset.	Minor
Delivery Chain Project fails to deliver objectives and outputs	Major	Rare	Moderate	The Project Board will meet each quarter to provide progress updates as part of the M&E process. Where objectives have not been met the team will discuss adjustments and identify necessary support and inform the Darwin Initiative team as appropriate.	Minor
Risk 4 Hurricanes or tropical storms impact fieldwork plans and research visits	Major	Likely	Severe	Fieldwork will resume after such events. While such events will disrupt fieldwork, one of the objectives of the project is to capture the impacts of these events, which will provide important data in terms of habitat and clutch loss/inundation.	Moderate
Risk 5 Loss of key personnel leading to loss of critical skills and tacit knowledge	Major	Unlikely	Major	Our quarterly Project Board meetings will ensure we detect any issues in advance and have mitigation plans in place to minimise impact.	Minor
Risk 6 Rising costs make project goals unachievable	Moderate	Unlikely	Moderate	Between stage 1 and 2 we adjusted the budget to take account of rising costs. Also, we increased the pay for the Post-doc to ensure the role is attractive to best applicants. Exchange rates may change but throughout the project the team will review costs and adjust activities as needed.	Minor

Section 8 - Implementation Timetable

Q19. Provide a project implementation timetable that shows the key milestones in project activities

Provide a project implementation timetable that shows the key milestones in project activities. Complete the Word template as appropriate to describe the intended workplan for your project.

[Implementation Timetable Template](#)

Please add/remove columns to reflect the length of your project. For each activity (add/remove rows as appropriate) indicate the number of months it will last, and fill/shade only the quarters in which an activity will be carried out.

 [BCF-Implementation-Timetable-Template-2022-23](#)

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Section 9 - Monitoring and Evaluation (M&E)

Q20. Monitoring and evaluation (M&E) plan

Describe how the progress of the project will be monitored and evaluated, making reference to who is responsible for the project's M&E.

Darwin Plus projects will need to be adaptive and you should detail how the monitoring and evaluation will feed into the delivery of the project including its management. M&E is expected to be built into the project and not an 'add' on. It is as important to measure for negative impacts as it is for positive impact. Additionally, please indicate an approximate budget and level of effort (person days) to be spent on M&E. For more information, see [Finance Guidance](#).

Robust monitoring and evaluation will be managed throughout the project by the project lead, Dr. Jane Hardwick, supported by the Project Board, who have worked together with CDoE before on successful Darwin projects. Roles and responsibilities will be assigned at the initiation of the project, along with an attainable reporting process integrated as part of the project deliverables and timeframe. Quarterly meetings of the project Project Board will be held either remotely or in person during field visits of UoE staff. These meetings will review activities and outputs to ensure goals are achieved in a timely fashion.

Field staff will be briefed on monitoring protocols and train in methods for consistent data collection at the beginning of each season. Staff will meet fortnightly to review practices and discuss concerns during the nesting season and protocols will be regularly discussed and updated as applicable. Meeting minutes will be taken and achieved in CDoE's secure server, and an end of season assessment will be conducted each year, resulting in updating of procedures for the next nesting season.

Outreach strategy meetings will be held once per month and the impact of outreach events will be assessed in surveys from students, teachers and attendees to public lectures and total number of attendees/participants.

An iterative process will be used for developing, standardizing and reviewing procedures for monitoring nests, deploying temperature loggers, and implementing experimental interventions to cool nests, stakeholder feedback will be obtained and results incorporated into protocols and policy documents.

As part of our M&E we will continue to assess the success of clutches laid in areas deemed vulnerable from our beach models. This will enable us to evaluate the accuracy of our predictions. Where clutches are relocated to new sites, we will assess their success in order to evaluate the suitability of sites.

Total project budget for M&E in GBP (this may include Staff, Travel and Subsistence costs)

██████████

Percentage of total project budget set aside for M&E (%)

█

Number of days planned for M&E

96

Section 10 - Logical Framework

Q21. Logical Framework (logframe)

Darwin Plus projects will be required to monitor and report against their progress towards their Outputs and Outcome. This section sets out the expected Outputs and Outcome of your project, how you expect to measure progress against these and how we can verify this.

Stage 2 Logframe Template

The **logframe template** (N.B. there is a different template for Stage 1 and Stage 2) needs to be downloaded from Flexi-Grant, completed and uploaded as a PDF within your Flexi-Grant application – **please do not edit the logframe template structure (other than adding additional Outputs if needed) as this may make your application ineligible**. On the application form, you will be asked to copy the Impact, Outcome and Output statements and activities - these should be the same as in your uploaded logframe.

Please upload your logframe as a PDF document.

 [Logical Framework Stage 2](#)

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Impact:

Mitigation of climate change impacts on sea turtle nesting populations in the Cayman Islands

Outcome:

Cayman Islands' turtles are safeguarded from habitat loss, skewed sex ratios, and reduced hatch success in the face of climate change, and serve as a flagship for enhanced coastal management

Project Outputs

Output 1:

Cayman-specific predictions for climate-related turtle nesting beach loss and temperature effects on turtle nests produced and published, for use in mitigation (Output 2) and management (Output 3)

Output 2:

Evidence-based protocols developed, trialled, and implemented to reduce nest loss due to SLR and protect populations from reduced hatch success and skewed sex ratios

Output 3:

Policy framework developed for coastal management and sea turtle conservation which can be used for decision-making in the Cayman Islands and as a model for other OTs

Output 4:

Results are widely shared through local and international outreach programme with sea turtles as a flagship species for sustainable coastal zone management

Output 5:

No Response

Do you require more Output fields?

It is advised to have fewer than 6 Outputs since this level of detail can be provided at the Activity level.

No

Activities

Each activity is numbered according to the Output that it will contribute towards, for example, 1.1, 1.2, 1.3 are contributing to Output 1.

- 1.1. Recruitment and successful appointment of field leaders (Y1, Q1) and postdoctoral researcher (Y1, Q2) and field leaders with relevant experience
- 1.2. Nesting patterns over time are examined using existing GIS mapping data and nesting habitat/nest inundation rates over time are examined to identify areas of high vulnerability
- 1.3. DTMs created to show historic and current beach profiles and SLR will be examined and modelled to predict future climate change will impact nesting beach habitat
- 1.4. Historic and current records of climate and storm impacts will be examined and modelled to predict how future climate warming and increase storminess could impact hatchling sex ratios, hatch success and nest inundation/loss of nesting habitat
- 2.1 Historic and current records of erosion will be examined and modelled alongside inundation and nest loss data to determine when nest relocation may be required
- 2.2 Sea Turtle Nest Monitoring Protocol updated to include current relocation practises based on findings of 2.1
- 2.3 Hatchling sex ratios are analysed using temperature logger data from at least 100 nests per season (50 C. mydas and 50 C. caretta nests) over 2 seasons
- 2.4 Hatchling sex ratios are analysed alongside environment variables and climate projections to determine future scenarios
- 2.5 Nest cooling techniques are evaluated, tested, and monitored
- 2.6 Cayman Islands National Sea Turtle Nest Monitoring Protocol updated based on findings in 2.5
- 3.1 Species Action Plan for Marine Turtles updated in order to outline most vulnerable areas of the islands in terms of erosion and SLR and to provide actionable steps to protect sea turtle populations from climate change
- 3.2 Meetings with and updating key stakeholders: National Conservation Council, Central Planning Authority, Development Control Board, Department of Planning, Cayman Islands Tourism Association, beachfront property owners' associations, Department of Tourism
- 3.3 Presentation for Ministry of Sustainability and Climate Resiliency
- 4.1 Production of resource packs for schools, preparation of presentation for schools and arranging school group field trips to observe how data are collected and why it is important
- 4.2 Creation of a dedicated page on the CIDoE website, CIDoE outreach to assist with regular social media posts, leaflet production and distribution, press releases, video production, and TV and radio interviews
- 4.3 Organising public meetings across each island each year to keep the public up to date on the research
- 4.4 Preparing research presentations at 2 international conferences
- 4.5 Preparing 2 papers for submission based on research findings

Section 11 - Budget and Funding

Q22. Budget

Please complete the template below which provides the Budget for this application. Some of the questions earlier and

below refer to the information in this spreadsheet.

[Budget form for projects over £100k](#)

Please ensure you include any co-financing figures in the Budget spreadsheet to clarify the full budget required to deliver this project.

NB: Please state all costs by financial year (1 April to 31 March) and in GBP. Darwin Plus cannot agree any increase in grants once awarded.

Please upload the Lead Partner's financial accounts at the certification page at the end of the application form.

Please upload your completed Darwin Plus Budget Form Excel spreadsheet using the field below.

 [BCF Budget over 100k MASTER Apr22](#)
 17/10/2022
 19:41:51
 xlsx 92.42 KB

Q23. Funding

Q23a. Is this a new initiative or a development of existing work?

New Initiative

Please provide details:

CIDoE monitor nesting of sea turtles as part of their core work carried out annually since 1998. This proposed project is, however, a new initiative that will use some existing data on nesting locations to inform the activities proposed. Monitoring temperature of clutches has only been carried out for a small number of nests in order to gain pilot data for the justification of this study. DTMs of beaches has not previously been conducted for this population but will be based on tried and tested methodologies developed by the UoE team. Current or future estimates of offspring production have not yet been undertaken although limited pilot data suggest that nest temperatures may already be in excess of those generating equal sex ratios.

Q23b. Are you aware of any other individuals/organisations/projects carrying out or applying for funding for similar work?

Yes

Please give details explaining similarities and differences, and explaining how your work will be additional and what attempts have been/will be made to co-operate with and learn lessons from such work for mutual benefits:

There are no other organisations conducting similar work in the Cayman Islands. Any other organisation conducting research must apply for permits through CIDoE. However, UoE are conducting similar studies in Ascension Island and Montserrat and at several locations around the world. Through these prior studies they have developed models for estimating and predicting future offspring sex ratios that will be used in this current study.

It is critical to use these methods to carry out the first comprehensive study on climate impacts to nesting populations in the Cayman Islands, where pilot data already indicate a female skewed sex ratio. In addition, the islands are low-lying and extremely vulnerable to impacts of SLR and storm surge which threatens sea turtle nesting beaches and less vulnerable areas must be identified for better protection.

Q24. Balance of budget spend

Defra are keen to see as much Darwin Plus funding as possible directly benefiting OT communities and economies.

While it is appreciated that this is not always possible every effort should be made for funds to remain in-Territory.

Explain the thinking behind your budget in terms of where Darwin Plus funds will be spent. What benefits will the Territory/ies see from your budget? What level of the award do you expect will be spent locally? Please explain the decisions behind any Darwin Plus funding that will not be spent locally and how those costs are important for the project.

All funds other than those of the UoE will be spent in the Cayman Islands. A significant proportion of the budget will be used to employ a post-doctoral research fellow based with the team in UoE but working extensively embedded in CIDoE, a decision taken based on our past experience of working with this team. The added value of having a full time post-doctoral researcher based within this group and at a UK university brings additional benefits to the project in terms of accessibility to research materials, climate data, data processing and the involvement of other staff with complementary expertise within this institute. Our previous Darwin collaborations with UoE have led to significant legislative and management changes in the Cayman Islands (Biodiversity Action Plan, Turtle Harvesting, Management of the Cayman Turtle Farm). These have been underpinned by numerous peer-reviewed scientific publications that have proved influential in bringing about these changes and offering insights and models for action in other locations.

Q25. Capital items

If you plan to purchase capital items with Darwin Plus funding, please indicate what you anticipate will happen to the items following project end. If you are requesting more than 10% capital costs, please provide your justification here.

The albedometer (to monitor sand colour and its influence on nest temperature), differential GPS (to create the 3D models of beaches) and temperature loggers (to monitor nest temperatures) purchased for this study will remain with CIDoE to enable future monitoring of clutches. A laptop will be purchased for the use of the UoE PDRF and can be left with CIDoE at the end of the project.

Q26. Value for Money

Please describe why you consider your application to be good value for money including justification of why the measures you will adopt will secure value for money.

This project brings significant match funding from both the CIDoE and UoE adding considerable resource directed towards the goals of this project.

This research will be the first of its kind in the Cayman Islands and has potential to safeguard sea turtles from falling into decline due to loss of nesting habitat, lowered hatch success and unbalanced offspring sex ratios. The results will be used to update CI Government policy documents, enabling change to coastal development with legally binding recommendations by the National Conservation Council (NCC).

The project will strongly benefit from having a 2.5 year Post Doctoral Research Fellow, with experience in climate modelling. Travel costs from UK to the Cayman Islands and subsistence costs in the Cayman Islands are very high. Where possible, communication with partner project staff will be facilitated by email or zoom. However, a yearly visit from UK project partners is required, and every effort has been made to reduce these costs (e.g. matched fund from DoE for accomodation, selecting accomodation with cooking facilities, travel outside of peak season where possible etc).

Published work from this study has the potential to assist other low-lying islands to safeguard their sea turtle populations through better protection of critical nesting habitat and monitoring/mitigation of climate related threats. In particular this could include Anguilla, BVI and TCI but learnings will also be complementary to similar work carried out at Ascension and BIOT.

Section 12 - Safeguarding and Ethics

Q27. Outputs of the project and Open Access

All outputs from Darwin Plus projects should be made available on-line and free to users whenever possible. Please outline how you will achieve this and detail any specific costs you are seeking from Darwin Plus to fund this.

We have included £[redacted] in UoE's portion of the budget to ensure any resulting publications are open access. CIDoE have also agreed to contribute £1000 towards this.

All project reports will be made available on the CIDoE website and provided to Darwin plus as required.

Q28. Safeguarding

Projects funded through Darwin Plus must fully protect vulnerable people all of the time, wherever they work. In order to provide assurance of this, projects are required to have appropriate safeguarding policies in place.

Please confirm the Lead Partner has the following policies in place and that these can be available on request:

Please upload the lead partner's Safeguarding Policy as a PDF on the certification page.

We have a safeguarding policy, which includes a statement of our commitment to safeguarding and a zero tolerance statement on bullying, harassment and sexual exploitation and abuse	Checked
We have attached a copy of our safeguarding policy to this application (file upload on certification page)	Checked
We keep a detailed register of safeguarding issues raised and how they were dealt with	Checked
We have clear investigation and disciplinary procedures to use when allegations and complaints are made, and have clear processes in place for when a disclosure is made	Checked
We share our safeguarding policy with all partners	Checked
We have a whistle-blowing policy which protects whistle blowers from reprisals and includes clear processes for dealing with concerns raised	Checked
We have a Code of Conduct for staff and volunteers that sets out clear expectations of behaviours - inside and outside the work place - and make clear what will happen in the event of non-compliance or breach of these standards	Checked

Please outline how you will implement your safeguarding policies in practice and ensure that all partners apply the same standards as the Lead Partner.

The Project Lead will be responsible for ensuring that processes are in place to recognise and respond to any safeguarding issues that arise during the project. UoE also has a Safeguarding Officer who can provide support and advice the UoE team. CIDoE will be responsible for providing the necessary training for those who may be working with all groups but especially those who may be in a vulnerable situation

Q29. Ethics

Outline your approach to meeting the key ethical principles, as outlined in the guidance. Additionally, are there any human rights and/or international humanitarian law risks in relation to your project? If there are, have you carried out an assessment of the impact of those risks, and of measures that may be taken in order to mitigate them? Any risk

assessment and mitigation of human rights and/or international humanitarian law risks should be included in the Question 18 on Risk Management.

The Project Board will ensure that all relevant permissions and ethical requirements associated with specific project activities are met from the outset, and will ensure adherence to these throughout the project, including compliance with national data protection legislation and obligations. We will review existing ethical approval procedures within partner organisations and assist in the establishment of processes, providing training where required. UoE staff will ensure that all activities conducted have approval from the UoE Ethics Committee.

Section 13 - Project Staff

Q30. Project staff

Please identify the core staff (identified in the budget), their role and what % of their time they will be working on the project.

Please provide 1-page CVs or job description, further information on who is considered core staff can be found in the [Finance Guidance](#).

Name (First name, Surname)	Role	% time on project	1 page CV or job description attached?
Jane Hardwick	Project Leader	40	Checked
Joseph Roche	Co-Project Leader	100	Checked
Janice Blumenthal	Project Advisor	10	Checked
Annette Broderick	Project Advisor	5	Checked

Do you require more fields?

Yes

Name (First name, Surname)	Role	% time on project	1 page CV or job description attached?
Brendan Godley	Project Advisor	5	Checked
Post-doctoral Research Fellow	Data Analyst and Climate Modeller	100	Checked
Gina Ebanks-Petrie	Project Advisor (CIDoE Director)	5	Checked
Timothy Austin	Research and Assessment Advisor	5	Checked
Judy Hurlston	Public Education and Outreach Advisor	5	Checked
John Bothwell	Policy and Management Advisor	5	Checked
Jeremy Olynik	Senior GIS Advisor	5	Checked
TBC	Project Assistant (Marine Resources)	10	Checked

Please provide 1 page CVs (or job description if yet to be recruited) for the project staff listed above as a combined PDF.

Ensure the file is named clearly, consistent with the named individual and role above.

 [CVs and Job Descriptions](#)

 17/10/2022

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 pdf 2.06 MB

Have you attached all project staff CVs?

Yes

Section 14 - Project Partners

Q31. Project partners

Please list all the Project Partners (including the Lead Partner – i.e. the partner who will administer the grant and coordinate the delivery of the project), clearly setting out their roles and responsibilities in the project including the extent of their engagement so far and planned.

This section should demonstrate the capability and capacity of the Project Partners to successfully deliver the project. Please provide Letters of Support for all project partners or explain why this has not been included.

The partners listed here should correspond to the Delivery Chain Risk Map (within the Risk Register template) which you will be asked to submit if your project is recommended for funding.

Lead partner name: Cayman Islands Department of Environment

Is the Lead Partner based in a UKOT where the project is working? Yes

Website address: <http://www.doe.ky>

Details (including roles and responsibilities and capacity to engage with the project): CIDoE has monitored Cayman Islands sea turtle populations since 1998 and was the lead partner for the highly-successful Darwin Plus Project “Socioeconomic aspects of turtle conservation in the Cayman Islands”, as well as being lead in-country partner for many other Darwin projects.

Over the past 25 years, the Department has become a centre of excellence for Caribbean marine turtle science, maintaining active research programmes and producing many scientific publications. DoE has an excellent track record of community involvement and outreach, including working with key stakeholder groups such as fishers, traditional users, and coastal property owners and residents. This includes consultations, public talks, press releases, and an active and dynamic volunteer base.

The project will be led by highly experienced research and field staff (Jane Hardwick, Joseph Roche, and Janice Blumenthal) and supported by CIDoE managers.

Allocated budget (proportion or value): ██████████

Representation on the Project Board (or other management structure) Yes

Have you included a Letter of Support from this organisation? Yes

Have you provided a cover letter to address your Stage 1 feedback? Yes

Do you have partners involved in the Project?

Yes

1. Partner Name: University of Exeter

Website address: <https://www.exeter.ac.uk/cornwall/research/facilitiesandcentres/cec/>

Details (including roles and responsibilities and capacity to engage with the project): Professors Broderick and Godley will advise on field methodologies and analysis. They have been conducting research into marine turtles for over 30 years and were involved in establishing a monitoring program in CI in 1998. The PDRF TBA will be responsible for data analysis and climate modelling and will be supervised by Professors Broderick and Godley but work in a fully integrated way as a member of the CIDoE team.

Allocated budget (proportion or value): ██████████

Representation on the Project Board (or other management structure) Yes

Have you included a Letter of Support from this organisation? Yes

2. Partner Name: *No Response*

Website address: *No Response*

Details (including roles and responsibilities and capacity to engage with the project): *No Response*

Allocated budget £0.00
(proportion or value):

Representation on the Yes
Project Board (or other No
management structure)

Have you included a Letter Yes
of Support from this No
organisation?

3. Partner Name: *No Response*

Website address: *No Response*

Details (including roles and *No Response*
responsibilities and
capacity to engage with
the project):

Allocated budget £0.00
(proportion or value):

Representation on the Yes
Project Board (or other No
management structure)

Have you included a Letter Yes
of Support from this No
organisation?

4. Partner Name: *No Response*

Website address: *No Response*

Details (including roles and *No Response*
responsibilities and
capacity to engage with
the project):

Allocated budget £0.00
(proportion or value):

Representation on the Yes
Project Board (or other No
management structure)

Have you included a Letter of Support from this organisation? Yes
 No

5. Partner Name: *No Response*

Website address: *No Response*

Details (including roles and responsibilities and capacity to engage with the project): *No Response*

Allocated budget (proportion or value): £0.00

Representation on the Project Board (or other management structure) Yes
 No

Have you included a Letter of Support from this organisation? Yes
 No

6. Partner Name: *No Response*

Website address: *No Response*

Details (including roles and responsibilities and capacity to engage with the project): *No Response*

Allocated budget (proportion or value): £0.00

Representation on the Project Board (or other management structure) Yes
 No

Have you included a Letter of Support from this organisation? Yes
 No

If you require more space to enter details regarding Partners involved in the project, please use the text field below.

No Response

Please provide a cover letter responding to feedback received at Stage 1 if applicable and a combined PDF of all letters

of support.

 [Support Letters from DoE and UoE](#)

 17/10/2022

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 pdf 590.06 KB

 [Cover Letter](#)

 17/10/2022

 21:12:37

 pdf 215.81 KB

Section 15 - Lead Partner Capability and Capacity

Q32. Lead Partner Capability and Capacity

Has your organisation been awarded Darwin Plus, Darwin Initiative or Illegal Wildlife Trade Challenge Fund funding before (for the purposes of this question, being a partner does not count)?

Yes

If yes, please provide details of the most recent awards (up to 6 examples).

Reference No	Project Leader	Title
DPLUS019	Janice Blumenthal	Socioeconomic aspects of turtle conservation in the Cayman Islands
DPLUS044	Gina Ebanks-Petrie	Assessment, protection and actions for important seabird populations
<i>No Response</i>	<i>No Response</i>	<i>No Response</i>
<i>No Response</i>	<i>No Response</i>	<i>No Response</i>
<i>No Response</i>	<i>No Response</i>	<i>No Response</i>
<i>No Response</i>	<i>No Response</i>	<i>No Response</i>

Have you provided the requested signed audited/independently examined accounts?

If yes, please upload these on the certification page. Note that this is not required from Government Agencies.

No

If no, please provide details.

Not required as CIDoE is a Government Agency.

Section 16 - Certification

Certification

On behalf of the

Company

of

Cayman Islands Department of Environment

I apply for a grant of

I certify that, to the best of our knowledge and belief, the statements made by us in this application are true and the information provided is correct. I am aware that this application form will form the basis of the project schedule should this application be successful.

(This form should be signed by an individual authorised by the applicant institution to submit applications and sign contracts on their behalf.)

- I have enclosed CVs for project key project personnel, a cover letter, letters of support, a budget, logframe, Safeguarding Policy and project implementation timetable.
- Our last two sets of signed audited/independently verified accounts and annual report are also enclosed.

Checked

Name	Jane Hardwick
Position in the organisation	Marine Research Officer and Sea Turtle Programme Coordinator
Signature (please upload e-signature)	 Signature (1)  17/10/2022  21:28:06  jpg 109.38 KB
Date	17 October 2022

Please attach the requested signed audited/independently examined accounts.

No Response

Please upload the Lead Partner's Safeguarding Policy as a PDF

 [Gender-Equality-Law](#)
 17/10/2022
 21:31:36
 pdf 79.18 KB

 [Whistleblower-Protection-Law-2015](#)
 17/10/2022
 21:31:14
 pdf 251.53 KB

 [Anti-Harassment Policy](#)
 17/10/2022
 21:30:49
 pdf 472.75 KB

 [Anti-Bullying-Harassment-and-Discrimination-Policy-FINAL](#)
 17/10/2022
 21:30:38
 pdf 275.41 KB

Section 17 - Submission Checklist

Checklist for submission

	Check
I have read the Guidance, including the "Darwin Plus Guidance", "Monitoring Evaluation and Learning Guidance", "Risk Guidance" and "Financial Guidance".	Checked

I have read, and can meet, the current Terms and Conditions for this fund.	Checked
I have provided actual start and end dates for the project.	Checked
I have provided my budget based on UK government financial years i.e. 1 April - 31 March and in GBP.	Checked
I have checked that our budget is complete, correctly adds up and I have included the correct final total at the start of the application.	Checked
The application been signed by a suitably authorised individual (clear electronic or scanned signatures are acceptable).	Checked
I have attached my completed logframe and timeline as a PDF using the templates provided.	Checked
I have included a 1 page CV or job description for all the Project Staff identified at Question 30, including the Project Leader, or provided an explanation of why not.	Checked
I have included a letter of support from the lead partner and main partner organisation(s), including relevant OT Governments, identified at Question 31, or an explanation of why not.	Checked
I have included a cover letter from the Lead Partner, outlining how any feedback received at Stage 1 has been addressed where relevant.	Checked
I have included a copy of the Lead Partner's safeguarding policy, which covers the criteria listed in Question 28.	Checked
I have included a signed copy of the last 2 annual report and accounts for the Lead Partner, or provided an explanation if not.	Checked
I have checked the Darwin Plus website immediately prior to submission to ensure there are no late updates.	Checked
I have read and understood the Privacy Notice on the Darwin Plus website.	Checked

We would like to keep in touch!

Please check this box if you would be happy for the lead applicant (Flexi-Grant Account Holder) and project leader (if different) to be added to our mailing list. Through our mailing list we share updates on upcoming and current application rounds under the Darwin Initiative and our sister grant scheme, the IWT Challenge Fund. We also provide occasional updates on other UK Government activities related to biodiversity conservation and share our quarterly project newsletter. You are free to unsubscribe at any time.

Checked

Data protection and use of personal data

Information supplied in the application form, including personal data, will be used by Defra as set out in the **Privacy Notice**, available from the [Forms and Guidance Portal](#).

This **Privacy Notice must be provided to all individuals** whose personal data is supplied in the application form. Some information may be used when publicising the Darwin Initiative including project details (usually title, lead partner, project leader, location, and total grant value).

Guidance – please delete before submitting

Provide a **Project Implementation Timetable** that shows the key milestones in project activities. Complete the following table as appropriate to describe the intended workplan for your project. Quarters are based on UK FYs (**1 April – 31 March** - Q1 therefore starts April 2023).

Please add/remove columns to reflect the length of your project. For each activity (add/remove rows as appropriate) indicate the number of months it will last, and shade only the quarters in which an activity will be carried out. The activity numbers should correspond to the activities in your logical framework (logframe). The workplan can span multiple pages if necessary.

This template covers multiple Biodiversity Challenge Funds schemes, so ensure you check the eligible dates/project length for the scheme you are applying to and feel free to delete later years if not applicable for your project.

	Activity	No. of months	Year 1 (23/24)				Year 2 (24/25)				Year 3 (25/26)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Output 1	Cayman-specific predictions for climate-related turtle nesting beach loss and temperature effects on turtle nests produced and published, for use in mitigation (Output 2) and management (Output 3)	33	■	■	■	■	■	■	■	■	■	■	■	
1.1	Recruitment and successful appointment of postdoctoral researcher (Y1, Q2) and field leaders (Y1, Q1) with relevant experience	6	■	■										
1.2	Nesting patterns over time examined using existing GIS mapping data and nesting habitat/nest inundation rates over time examined to identify areas of high vulnerability	12	■	■	■	■								

Project Title: Mitigating the Impacts of Climate Change on Sea Turtle Populations

	Activity	No. of months	Year 1 (23/24)				Year 2 (24/25)				Year 3 (25/26)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1.3	Digital terrain maps created and historic and current records of beach profiles and sea level rise examined and modelled to predict how future climate change will impact nesting beach habitat	30	■	■	■	■	■	■	■	■	■			
1.4	Historic and current records of climate and storm impacts will be examined and modelled to predict how future climate warming and increase storminess could impact hatchling sex ratios, hatch success and nest inundation/loss of nesting habitat	30	■	■	■	■	■	■	■	■	■			
Output 2	Evidence-based protocols developed, trialled, and implemented to reduce nest loss due to sea level rise and protect populations from reduced hatch success and skewed sex ratios	24					■	■	■	■	■	■	■	
2.1	Historic and current records of erosion will be examined and modelled alongside inundation and nest loss data to determine when nest relocation may be required	12	■	■	■	■								
2.2	Sea Turtle Monitoring Protocol will be updated to include current	1				■								

Project Title: Mitigating the Impacts of Climate Change on Sea Turtle Populations

	Activity	No. of months	Year 1 (23/24)				Year 2 (24/25)				Year 3 (25/26)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	relocation practises based on findings of 2.1													
2.3	Hatchling sex ratios are analysed using temperature logger data from at least 100 nests per season (50 green and 50 loggerhead nests) over 2 seasons	15			■	■			■	■	■			
2.4	Hatchling sex ratios are analysed alongside environment variables and climate projections to determine future scenarios	15			■	■			■	■	■			
2.5	Nest cooling techniques are evaluated, tested, and monitored	18					■	■	■		■	■	■	
Output 3	Policy framework developed for coastal management and sea turtle conservation which can be used for decision-making in the Cayman Islands and as a model for other OTs.	12									■	■	■	■
3.1	Species Action Plan for Marine Turtles updated in order to outline most vulnerable areas of the islands in terms of erosion and sea level rise and to provide actionable steps to protect sea turtle populations from climate change	9									■	■	■	
3.2	Meeting with and updating key stakeholders: National Conservation Council, Central	3	■					■						■

Project Title: Mitigating the Impacts of Climate Change on Sea Turtle Populations

	Activity	No. of months	Year 1 (23/24)				Year 2 (24/25)				Year 3 (25/26)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Planning Authority, Development Control Board, Department of Planning, Cayman Islands Tourism Association, beachfront property owners' associations, Department of Tourism													
3.3	Initial consultation and final presentation and Policy Paper for Ministry of Sustainability and Climate Resiliency	2	■										■	
3.4														
3.5														
Output 4	Results are widely shared through local and international outreach programme with sea turtles as a flagship species for sustainable coastal zone management.	36	■	■	■	■	■	■	■	■	■	■	■	■
4.1	Production of resource packs for schools, preparation of presentation for schools and arranging school group field trips to observe how data are collected and why it is important	36	■	■	■	■	■	■	■	■	■	■	■	■
4.2	4.2 Creation of a dedicated page on the CIDoE website, DoE outreach to assist with regular social media posts, leaflet production and distribution, press	36	■	■	■	■	■	■	■	■	■	■	■	■

Project Title: Mitigating the Impacts of Climate Change on Sea Turtle Populations

	Activity	No. of months	Year 1 (23/24)				Year 2 (24/25)				Year 3 (25/26)			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	releases, video production, and TV and radio interviews													
4.3	Organising public meetings across each island each year to keep the public informed	3	■				■							■
4.4	Preparing and presenting research at 2 international conferences	2					■				■			
4.5	Preparing 2 papers for submission based on research findings	18							■	■	■	■	■	■

Project Title: Mitigating the impacts of climate change on sea turtle populations

Project Summary	SMART Indicators	Means of Verification	Important Assumptions
Impact: Mitigation of climate change impacts on sea turtle nesting populations in the Cayman Islands (Max 30 words)			
Outcome: (Max 30 words) Cayman Islands' turtles are safeguarded from habitat loss, skewed sex ratios, and reduced hatch success in the face of climate change, and serve as a flagship for enhanced coastal management	0.1 Baseline data collected and mapping and modeling completed to produce an evidence-based assessment of the effects of climate change on sea turtle nesting habitat availability, sex ratio, and hatch success in the Cayman Islands, including vulnerable areas and high priority beaches for protection (Y3 Q3). 0.2 National Sea Turtle Nest Monitoring Protocols include tested Cayman-specific methods to mitigate climate threats (Y3 Q3), resulting in hatch success maintained above 65% and sex ratio stabilised at $\pm 10\%$ of the baseline identified through the project or at an optimal level determined through modeling (Y3 Q2). 0.3 Through a consultative process, the Cayman Islands	0.1 Database of baseline data, digital terrain maps (DTMs) showing past and present nests, habitat loss model results and sex ratio model results 0.2 Text of National Sea Turtle Nest Monitoring protocols 0.3 Text of Cayman Islands Species Action Plan for Marine Turtles and other relevant policy documents, minutes of stakeholder and decision-maker meetings, archive of media and outreach materials on the project website.	Data loggers are deployed and sufficient high quality field data is collected to allow mapping and modelling <u>CIDoE has an annual sea turtle monitoring programme which has been in continuous operation since 1998, minimising risks for data gathering</u> Cayman Islands government decision-makers are willing to incorporate results into national policy <u>The applicant organisation (CIDoE) is directly responsible for the development of Sea Turtle Nest Monitoring Protocols and drafts conservation plans and reviews coastal development applications to assess environmental impacts under delegated authority from the Cayman Islands National Conservation Council.</u>

Project Title: Mitigating the impacts of climate change on sea turtle populations

	<p>Species Action Plan for Marine Turtles and other key turtle conservation and climate change policy documents are updated with actionable steps for the protection of Cayman Islands sea turtle populations from climate impacts (Y3 Q3).</p>		<p>No major disruption occurs during data collection, e.g., hurricanes that may impact biology and logistics</p>
<p>Outputs: 1. Cayman-specific predictions for climate-related turtle nesting beach loss and temperature effects on turtle nests produced and published, for use in mitigation (Output 2) and management (Output 3)</p>	<p>1.1 3D DTMs produced, including estimated proportion of nests inundated/lost under various sea level rise (SLR) scenarios and increased storm activity/beach erosion, safe and vulnerable locations, and key habitats for protection (Y2 Q2)</p> <p>1.2 Baseline hatchling sex ratios determined for the three islands across a selection of beaches (Y2 Q4)</p> <p>1.3 Models produced to predict how climate change scenarios may impact sex ratios and hatching success</p>	<p>1.1 UoE employment records for employment of post-doctoral researcher, DTM outputs and project reports/scientific papers</p> <p>1.2 Temperature logger data from ~200 nests for loggerhead (<i>C. caretta</i>) and green (<i>C. mydas</i>) sea turtles, project report/scientific papers</p> <p>1.3 Climate model output and project reports/ journal submission email</p> <p>1.4 Model output and project reports/journal submission email</p>	<p>A suitable candidate with experience needed for climate modelling applies and is available for the duration of the project</p> <p><u>The project partners will advertise the position in appropriate channels for maximum visibility</u></p> <p>Historic climate data and SLR data are obtained</p> <p>Non-lethal indirect methods of estimating sex ratios and modeling future nest temperatures are sufficiently robust</p>

Project Title: Mitigating the impacts of climate change on sea turtle populations

	<p>as well as to estimate optimal nest incubation temperatures to ensure population persistence (Y3 Q2)</p> <p>1.4 An evaluation is produced of observed and predicted phenological and location shifts for turtle nesting, along with their consequences for mitigation and management (e.g. areas of beach/land for protection as refugia or male-producing beaches) (Y3 Q2)</p>		
<p>2. Evidence-based protocols developed, trialled, and implemented to reduce nest loss due to SLR and protect populations from reduced hatch success and skewed sex ratios</p>	<p>2.1 As appropriate, at least two robust practical adaptation measures are developed to reduce nest loss and maintain appropriate nest temperature: these may include interventions such as relocation of nests from vulnerable beaches or manipulation of incubation temperatures via planting native vegetation, artificial shading or water sprinklers (Y3, Q3). Choice will be based on preliminary results from season 1 and further</p>	<p>2.1 Results and photographs of at least 2 practical adaptation trials</p> <p>2.2 Text of updated National Sea Turtle Monitoring protocols</p> <p>2.3 Monitoring results from Y3</p>	<p>A large enough sample size is obtained to infer accurate <i>C. caretta</i> and <i>C. mydas</i> sea turtle sex ratios for the Cayman Islands</p> <p><u>Based on recent years nest counts, the desired sample size should be obtained</u></p> <p>Effective interventions are identified which are viable under local conditions and within the current capacity of the CIDoE</p> <p><u>We will prioritize strategies which require minimum intervention and maximal dividend per unit resource. The project has a</u></p>

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	<p>informed by season 2.</p> <p>2.2 Cayman Islands National Nesting Beach Monitoring Protocols are updated and Sea Turtle Climate Change Monitoring and Mitigation Protocols are created to include practical adaptation measures (e.g. criteria for nest relocation or shading of nests or indicators of when these interventions would be necessary in the future) (Y3 Q4)</p> <p>2.3 Protocols are implemented, ensuring that hatch success remains above 65%, and sex ratios are maintained at $\pm 10\%$ of the baseline identified through the project or at optimal levels based on population modelling (Y3 Q4)</p>		<p><u>strong educational component which will allow collaboration with beachfront property owners on low-cost strategies e.g. maintenance of native vegetation</u></p>
<p>3. Policy framework developed for coastal management and sea turtle conservation which can be used for decision-making in the Cayman Islands and as a model for other OTs</p>	<p>3.1 Consultation and engagement has taken place with key stakeholders and government decision-makers: National Conservation Council, Ministry of Sustainability and Climate Resiliency, Central Planning Authority, Development</p>	<p>3.1 Text of Species Action Plan</p> <p>3.2 Text of other relevant policy documents</p> <p>3.3 Attendance register, meeting minutes and feedback forms</p>	<p>Policy makers are amenable to implementing change based on the outcome of the research</p> <p><u>The Cayman Islands Department of Environment is the lead partner on this project and the Ministry of Sustainability and Climate Resiliency have made it</u></p>

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	<p>Control Board, Department of Planning, beachfront property owners' associations, Department of Tourism, including meetings in Y1, Q1, Y2, Q2 and Y3, Q4</p> <p><u>3.2</u> Cayman Islands Species Action Plan for Marine Turtles updated to include actionable steps to protect sea turtles from loss of nesting habitat and other impacts of climate change (Y3, Q3)</p> <p><u>3.3</u> Conservation Plan and Species Action Plan for Marine Turtles, and other relevant policy documents updated (Y3, Q4 or first statutory update of documents), enabling effective reviews of coastal development applications by the Cayman Islands Department of Environment (CIDoE) and legally binding recommendations by the Cayman Islands National Conservation Council for the protection of sea turtle critical habitat (NCC)</p>	<p>3.3 Attendance register, meeting minutes and feedback forms</p> <p>3.4 Meeting minutes</p>	<p><u>high priority to have new climate change policy implemented</u></p>
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<p>4. Results are widely shared through local and international outreach programme with sea turtles as a flagship species for sustainable coastal zone management</p>	<p>4.1 School Outreach Campaign – teacher resource packs produced on sea turtles, climate change, and sustainable coastal development for primary and secondary schools (1 resource pack for primary schools (Y2 Q1), 1 resource pack for secondary school (Y2 Q1), at least 6 school presentations, at least 8 field events for schools (Y1 – 3)</p> <p>4.2 Media Outreach Campaign conducted to inform the public of climate-related threats to sea turtles and the necessity of sustainable coastal zone management and climate change response (Y1 – 3). At least 2 press releases per year (Y1,Q1; Y1;Q3; Y2,Q1; Y2;Q3; Y3, Q1; Y3;Q3)</p> <p>4.3 A minimum of three public meetings (one on each island) held in Y1,Q2 to outline the aims of the project</p>	<p>4.1 Copies of materials, photographs, schedule of school names, year groups, presentation dates, and number of students reached (Target 500 students engaged)</p> <p>4.2 Up to date project website, copies of newspaper articles (Target 12 print/online news articles), videos, leaflets, radio and TV interviews (Target 6 broadcast items), and social media posts (Target 30 substantive items across the project duration)</p> <p>4.3 Minutes of public meetings (Target 6; 300 attendees), photographs, social media posts</p> <p>4.4 Conference proceedings, copies of scientific publications or submission emails</p>	<p>Wider society, including schools are prepared to engage with the project</p> <p>International conferences persist, at least in online format</p>
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	<p>and gather public input and in Y3, Q3 to present results and gather feedback</p> <p>4.4 Findings presented at 2 international conferences, including a regional OT conference (estimates Y2,Q2, Y3,Q2), and a minimum of 2 papers will be published from the study (Y2,Q3; Y3;Q2 3)</p>		
<p>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. Each activity should start on a new line and be no more than approximately 25 words.)</p> <p>1.1. Recruitment and successful appointment of field leaders (Y1, Q1) and postdoctoral researcher (Y1, Q2) and field leaders with relevant experience</p> <p>1.2. Nesting patterns over time are examined using existing GIS mapping data and nesting habitat/nest inundation rates over time are examined to identify areas of high vulnerability</p> <p>1.3. DTMs created to show historic and current beach profiles and SLR will be examined and modelled to predict future climate change will impact nesting beach habitat</p> <p>1.4. Historic and current records of climate and storm impacts will be examined and modelled to predict how future climate warming and increase storminess could impact hatchling sex ratios, hatch success and nest inundation/loss of nesting habitat</p> <p>2.1 Historic and current records of erosion will be examined and modelled alongside inundation and nest loss data to determine when nest relocation may be required</p> <p>2.2 Sea Turtle Nest Monitoring Protocol updated to include current relocation practises based on findings of 2.1</p>			

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- 2.3 Hatchling sex ratios are analysed using temperature logger data from at least 100 nests per season (50 *C. mydas* and 50 *C. caretta* nests) over 2 seasons
- 2.4 Hatchling sex ratios are analysed alongside environment variables and climate projections to determine future scenarios
- 2.5 Nest cooling techniques are evaluated, tested, and monitored
- 2.6 Cayman Islands National Sea Turtle Nest Monitoring Protocol updated based on findings in 2.5

- 3.1 Species Action Plan for Marine Turtles updated in order to outline most vulnerable areas of the islands in terms of erosion and SLR and to provide actionable steps to protect sea turtle populations from climate change
- 3.2 Meetings with and updating key stakeholders: National Conservation Council, Central Planning Authority, Development Control Board, Department of Planning, Cayman Islands Tourism Association, beachfront property owners' associations, Department of Tourism
- 3.3 Presentation for Ministry of Sustainability and Climate Resiliency

- 4.1 Production of resource packs for schools, preparation of presentation for schools and arranging school group field trips to observe how data are collected and why it is important
- 4.2 Creation of a dedicated page on the CDoE website, CDoE outreach to assist with regular social media posts, leaflet production and distribution, press releases, video production, and TV and radio interviews

- 4.3 Organising public meetings across each island each year to keep the public up to date on the research
- 4.4 Preparing research presentations at 2 international conferences
- 4.5 Preparing 2 papers for submission based on research findings