DARWIN INITIATIVE FOR THE SURVIVAL OF SPECIES: APPLICATION FOR GRANT FOR ROUND 10 COMPETITION

DEFRA
Department for Environment, Food & Rural Affairs

Please read the accompanying Guidance Note before completing this form. Give a full answer to each section; applications will be considered on the basis of information submitted on this form. Applicants are asked not to use the form supplied to cross-refer to information in separate documents except where this is invited on the form. The space provided indicates the level of detail required but you may provide additional information on a separate sheet if necessary. Copies of this form are available on disk or by e-mail on request. You are asked also to complete the summary sheet. Although you may reproduce this sheet in a reasonable font, you should not expand it beyond an A4 sheet (leaving the allocated space for DEFRA comments to be made) as additional information will not be taken into account.

1. Name and address of organisation

Centre for Ecology and Hydrology - Monks Wood. Abbots Ripton, Huntingdon, Cambridge PE28 2LS (in partnership with the Faculty of Science, University of Sierra Leone)

2. Principals in project

Details	Project leader	Other UK personnel (if working more than 50% of their time on project)	Main project partner or co-ordinator in host country
Surname	Wadsworth		Karim
Forename(s)	Richard Allen		Abdul B.
Post held	Head Ecological Systems Modelling Group		Deputy Head, Environmental Sciences Division
Institution (if different to above)			University of Sierra Leone
Department	Ecological Processes and Management Section		Biology
Telephone			
Fax			
Email			

Please provide a one page CV for each of these named individuals.

3. Project title (not exceeding 10 words)

Habitat audit and change detection in Sierra Leone

4. Abstract of study (in no more than 750 characters)

Ten years of civil strife in Sierra Leone have led to massive redistributions of the human population, the effect of these changes on biodiversity is currently unknown but suspected to be adverse. As a first step we wish to: a) transfer skills necessary to map land cover changes using remote sensing, b) to quantify the changes in habitats in the country during the period 1991 to 2001, c) to strengthen biodiversity research links internally and externally.

By the end of this project staff will have the capacity to generate land cover maps by combining spectral data (from Landsat 5 & 7), biomass data (derived from ERS-1 synthetic apature radar) and image texture data. They will have the capability to use GIS for mapping, spatial analysis and modelling.

It is intended to concentrate on three areas; north (Scarcies to the OK National Park), south (Gola & Tiwai) and the Freetown Peninsular.

5. Timing. Give the proposed starting date and duration of the project.

April 2002 to March 2004

6. Describe briefly the aims, activities and achievements of your organisation. (Please note that this should describe your unit, institute or department within a university.)

Aims

CEH Monks Wood conducts high-quality, long-term research in terrestrial ecosystem processes, with an emphasis on environments that are strongly influenced by human activities. The research seeks to understand processes controlling biodiversity and ecosystem function, the movement, metabolism and effects of chemicals in the environment, and the impacts of man-made environmental changes on natural and semi-natural ecosystems.

Activities

Our science programme is underpinned by research into the acquisition, management and application of extensive and long-term environmental datasets, many of which are unique and of national importance. These underpinning research activities include: Earth observation science, Spatial and process modelling, Biometrics and Information system design.

Areas of expertise include: Survey and evaluation techniques, both land based and from Earth observation. Prediction and monitoring of the response of biological systems to change. Environmental impact assessment. Rehabilitation of natural and semi-natural ecosystems

Achievements

The Section for Earth Observation is nearing completion of the second land cover map of Great Britain a sophisticated hierarchical classification of the land cover and land use of all of Great Britain. The expertise of the section has been employed in a previous Darwin Initiative project mapping habitats in Uganda (see Q7, and attached section leaflet).

The Environmental Information Centre is the NERC designated data centre for terrestrial and freshwater ecology and currently curates, disseminates and exploits the nearly 10 million records of species in the UK. The expertise of the EIC has been employed in an earlier Darwin Initiative project in Vietnam (see Q7, and attached section leaflet).

The Ecological System Modelling Group is a recent amalgamation of the Geographical Information Systems Unit and the Statistical and Biometrics Group. Much of its work involves the synergistic exploitation of multiple data sets to study population dynamics and spatial processes at a range of spatial and temporal scales (see attached section leaflet).

Tropical Forest Section (at CEH Bush) is a major contributor of the Edinburgh Centre for Tropical Forests (ECTF). They have recently been awarded a contract to monitor and evaluate the Darwin Initiative projects.

7. Has your organisation received funding under the Initiative before? If so, please give details.

1. CEH-Monks Wood in collaboration with Kings College London and the Ugandan National Biodiversity Data Bank used remote sensing techniques to map habitats of 3000 sq km of Sango Bay. Habitat data was used as the basis of biotope and species distribution mapping.

2. CEH-Monks Wood in collaboration with the Field Studies Council and the National University of Hanoi and National Environmental Agency Vietnam. Conserving Vietnam's biodiversity through improved water quality assessment and management.

3. CEH-Bush Preservation, rehabilitiation and utilisation of Vietnamese montane forests (through the ECTF)

4. CEH-Bush Darwin Initiative Monitoring and Evaluation Projects (through the ECTF)

8. Which overseas institutions, if any, will be involved in the project? Please explain the responsibilities of these institutions.

The Department of Biology at the University of Sierra Leone (Fourah Bay College) is a recent amalgamation of the Departments of Zoology and Botany and will be the main direct beneficiaries of the technology transfer. The Department will:

1) Select appropriate Teaching and Research Associates for training,
2) Identify and liaise with Government staff responsible for the National Environment Action Plan, and other stakeholders in Government departments (Forestry, Agriculture, Fisheries) and NGOs (Conservation Society, UNDP etc.),
3) Develop appropriate material for the Public Understanding of Science "packs" for local schools and for journalists,
4) Provide secure accommodation for the Darwin Project with a reliable power supply (from the Faculty of Engineering),
5) Provide access to a university vehicle and driver for field work,
6) Find a range of suitable field assistants from the Agriculture and Forestry Departments to provide specialist knowledge on agricultural and forestry practices and types.

PROJECT DETAILS

9. Define the purpose (main objective) of the project in line with the logical framework.

To transfer the skills necessary to produce habitat maps and detect changes in habitats by integrating multi-spectral and synthetic aperture radar remotely sensed imagery.

To strengthen the institutional capability of the Department of Biology and the Faculty of Science of the University.

To strengthen the ability of Sierra Leone to fulfil its Natural Environment Action Plan (NEAP) and to develop its National Strategy on Sustainable Development (NSSD) (obliged to produce by 2005).

To produce example maps and statistics of habitats and changes in habitats over the period 1991 to 2001.

To raise awareness of the importance of biodiversity and the natural environment among the general population and politicians.

To provide a spatial and conceptual framework for ongoing and future biodiversity assessment and monitoring.

10. Is this a new project or the continuation of an existing one?

This is a new project, however, it will form an important corner stone of the NEAP, inform the formulation of the NSSD and help foster the ongoing activities of the University and Conservation Society.

11. What is the evidence for a demand or need for the work? How is the project related to conservation priorities in the host country(ies)? How would the project assist the host country with its obligations under the Biodiversity Convention?

How was the work identified?

1. The University, local Conservation Society of Sierra Leone, local and international NGO's all recognise that the major change in the distribution of people in Sierra Leone has had a significant impact on habitats and land cover, but, there are no estimates of its extent, magnitude or significance.

2. Estimates of habitats and land cover are needed to develop the NSSD.

3. Fieldwork is inadvisable in some areas of the country even where it is possible mapping vegetation types in moist tropical forest environments from the ground is very difficult and time consuming. Combing radar and visible spectral data should will allow separation of habitats such as "farm bush" from "secondary" forest and forest from plantation.

4. PI (SL) was a major contributor to the development of the NSSD.

5. PI (UK) has had formal and informal contact with Sierra Leone since 1981and wishes to contribute to its well-being.

How is the project related to conservation priorities in the host country?

The host country needs to update its inventory of the biological and biodiversity resources that it possesses.

The host country needs to be able to quantify the changes that have taken place during the current troubles (1991-2001).

The host country needs the capability to monitor change as reconstruction commences and to establish a skills base on which future work can be built.

The most recent estimate of forest cover (FAO 1988) will be 15 years old by the time the project starts, unfortunately, it relied just on visible band remote sensing and it fails to distinguish primary from secondary forest and may systematically under-estimate the extent of secondary forest.

How will the project assist the host country meet its obligations under the Biodiversity Convention?

Sierra Leone cannot protect what it does not know it has, neither can it develop appropriate policies and strategies without a knowledge of what is endangered. The NEAP identifies forests and particularly the "Upper Guinea Forests" as a biodiverse environment in need of protection from agriculture and forestry (c.f. current activities in Liberia). The NSSD will involve decisions about what areas and habitats to exploit, what to use sustainably and what to protect. The livelihood of the majority of the rural population is intimately related to the biodiversity of the country, forests and wild lands provide: physical security, food security in time of famine, a wide range of medicinal plants and a source of goods to barter. These issues need to be acknowledged when agricultural (re)development commences. Changes in the extent and exploitation of other biotopes, such as, mangrove swamps inland wetlands, gallery forests etc. may be having an impact on the biodiversity resource of the country but the extent is not known. Changes in farming activity particularly the timing, frequency and severity of fires may have accelerated the spread of *lophia lanceolata* woodland (identified as a problem by the PI in early 1980's).

12. In what ways can this project be considered a Darwin project? How does the project relate to the Darwin principles? How would the project be advertised as a Darwin project and in what ways would the Darwin name and logo be used?

Sierra Leone is rich in the biodiversity of species and in habitats but desperately poor in financial resources. The displacement of a significant proportion of the rural population (>25%) has dramatically altered the landscape of the country. The SL Government's first priority must be to house and feed the displaced population. The University, Conservation Society of Sierra Leone and the National Environment Action Plan in Sierra Leone are attempting to establish a stable foundation from which sustainable use can develop. By 2005 Sierra Leone will have to produce its National Strategy on Sustainable Development this will be difficult without the means of assessing its current biodiversity resource and how it is changing.

Darwin principles: this project is working in a Sierra Leone which is rich in biodiversity but economically impoverished and attempting to reconstruct its economy. It will help meet the requirements of the biodiversity convention. It is genuinely collaborative and will help maintain and strengthen links between researchers (Article 22 & 28 of the Convention). It is working in an area of science where the UK (CEH) has world renown. It will transfer technological skills and generate data for the public domain. It will help create a foundation for stable and sustained economic growth.

The Darwin name and logo: these would be used extensively in the "schools pack" and "journalists pack" prepared as part of the public understanding of science part of this project. The stakeholder workshop and dissemination workshop would be publicised as DI sponsored events. All reports and papers would acknowledge the support received from the DI. The project would enthusiastically cooperate with the British Council and British High Commission in any of their activities that were relevant.

13. Set out the proposed timetable for the work, including the programme's measurable outputs using the attached list of output measures.

PROJECT OUTPUTS		
Year/Month (starting April)	Output Number (see standard output measures)	Description (include numbers of people involved, numbers of publications printed or produced and days/weeks where applicable
2004/3	4C	2 people
2004/3	4D	12 weeks
2003/2	7	4 (“primary school pack”, “secondary school / environment club pack”, “tertiary education pack”, “local journalist pack”)
2003/2	8	12 weeks
2003/2	10	1 (“ A guide to the classification of habitats in Sierra Leone using RS”)
2004/3	11B	2 (“Mapping habitats in Sierra Leone”, to be submitted to International Journal of Remote Sensing and “Conflict mediated changes in habitat in Sierra Leone”, to be submitted to Biological Conservation?)
2004/3	12A	1 (spectral and other information for RS habitats in SL)
2003/1 : 2004/3	14A	2 (“habitats” workshop and “closing” workshop)
2004/1	14B	1 (BES?)
2003/1	15A	2 (“what we are planning to do”, “what we achieved” in parallel with 19A)
2003/1	17B	1 (network between University, CSSL, BRN, and externally to CCF)
2003/1 : 2004/3	19A	2 (in parallel with 15A)
2004/3	20	£12,150 (computer, printer and imagery) + unknown amount for maps
2004/3	21	1 (Habitat mapping centre as part of Faculty of Science)

Key Milestones	
Year/Month (starting April)	Description (include travel dates, drafts and other processes that support the delivery of outputs)
2002/4	Establish “memorandum of understanding” between CEH and University of SL (see monitoring section)
2002/11	Identify candidates to be trained
2003/1	Organise first workshop to identify key habitats to map and test sites (University + NEAP + Government Departments + national and international NGOs)
2002/10	Obtain imagery and computer hardware
2003/1	Establish base at the University and begin RS training
2003/1	prepare "publicity pack"
2003/1	"hard" and "soft" classification of multispectral data of first test site
2003/2	Biomass and texture estimates (from SAR) of first test site
2003/2	Combination of multi-spectral and biomass data (distinguishes farm bush from secondary forest) and texture data (distinguishes primary and secondary forest) of first test site.
2003/2	Validation / verification of first test site
2003/3	Trial primary, secondary and tertiary information packs
2003/3	"Distance learning" trial by e-mail
2004/1-3	Second round of in-country training and further
2004/3	Closing workshop (University + NGOs) - final maps of all three test sites distributed.
2004/3	Dissemination of results (published papers)

14. Do you know of any other individual/organisation carrying out similar work? Give the details of the work, explaining the similarities and differences.

There is no similar work going on in Sierra Leone although several organisations have identified the need they have lacked either the financial resources or the technical capability to do so. Several organisations within the Cambridge Conservation Forum have expressed a desire to be kept informed of progress with a view to using the outputs of this project as a framework for their own data and data collection exercises.

Fauna & Flora International with Conservation International (Washington DC) are starting to use multi-spectral RS to map part of Lofa County (Liberia), they also have a DI grant relating to the Sapo National Park.

15. Will the project include training and development? Please indicate how many trainees will be involved, from which countries and what will be the criteria for selection. How will you measure the effectiveness of the training and will those trained then be able to train others? Where appropriate give the length of any training course.

Training Activity	Dates	Who will participate, how many will participate and for how long?
1. Computer centred training in RS using Idrisi-32 to classify habitats using multi-spectral and SAR data.	2003/1-3 & 2004/1-3	1, 2 & 3 Candidates will be selected through recommendation and interview. Two teaching assistants / research associates. Total in-country training of 3 months, informal distance learning 12 months.
2. Informal "distance learning" by e-mail	2003/3 – 2004/1	
3. Validation and verification (sometimes wrongly called "ground truth" location and duration subject to health and safety concerns)	2003/3 & 2004/3	
4. Dissemination and communication, especially with regard to public understanding of science through schools and local papers.	2003/3 & 2004/3	4. Primary & secondary school children & environment clubs, will receive visits and be invited to enter competitions (the quality of their response allows us to assess our success in communicating science).

16. How will trainee outcomes/destinations be monitored after the end of the training?

The trainees will be assessed at the end of each period of training and their destination after the training will be followed by the University. Twelve months after the end of the project a formal review will be made of the take up of the technology and the subsequent activities of the trainees.

17. How is the work of the project expected to continue after the end of grant period? A clear exit strategy must be included.

By transferring the skills and technology to workers in Sierra Leone they will be able to identify and quantify changes in other parts of the country, they will also be able to monitor change over the next few years as hopefully the population returns to a more equitable distribution. The maps and data generated will have a wide range of uses other than Biodiversity (agriculture, housing, transport etc.).

The maps and data produced will provide a strong spatial framework for understanding the distribution and movement of many species. These will be used by the Conservation NGOs nationally and internationally (see attached).

By increasing awareness among the general population and amongst politicians of the importance of the natural environment it increases the possibility that reconstruction of the country will follow a sustainable course.

The project will be reviewed at the end of 12 months and a decision will be made as to whether the project should continue to the second year. Opinions and advice will be solicited from the stakeholder community in this review.

MONITORING AND EVALUATION

18. Describe how progress on the project would be monitored and evaluated in terms of achieving its aims and objectives, both during the lifetime of the project and at its conclusion. How would you ensure that it achieves value for money? What arrangements will be made for disseminating results? If applicable, how would you seek the views of clients/customers?

Central to the monitoring and evaluation will be the "memorandum of understanding" between the University and CEH that will set out what each partner expects of the other. Regular reports will be prepared for the DI as well as the management of CEH and the University.

CEH-Bush has recently been awarded a contract to assess the monitoring and evaluation of Darwin Initiative projects, we will liase with them and follow whatever is considered to be the optimum strategy.

The usefulness of the audit and change maps will be assessed by soliciting responses from the stakeholder community that will already have expressed their needs at the initial workshop. In addition to "work in progress" reports and maps to the stakeholders, there will also be a final workshop to involve all stakeholders.

The success of the "public understanding of science" objectives will be assessed qualitatively from the quality of the entries to the competitions we intend to run. A qualitative assessment will also be made from the reports that appear in the newspapers and on the radio.

The overall success of the project can be objectively assessed by observing how easy it is to obtain further funds to extend the analysis to other test sites and periods and how widely the techniques are adopted within the University and elsewhere in Sierra Leone, especially its influence on the NEAP and NSSD.

Logical framework. Please enter the details of your project onto the matrix using the note at Annex B of the Guidance Note.

Project summary	Measurable indicators	Means of verification	Important assumptions
Goal *To assist countries rich in biodiversity but poor in resources with the conservation of biological diversity and implementation of the Biodiversity Convention*		Use of better data within the National Environment Action Plan and by Conservation minded organisations within and outside Sierra Leone.	Better information leads to better decisions.
Purpose Transfer skills and technology necessary to produce reliable maps of habitats and change in habitats from multi-spectral and SAR imagery.	Ability of staff in the Department of Biology and Government Departments to generate maps of land cover and quantify change.	Quantitative assessment of products. Qualitative assessment of performance. Take up of product and process by NGOs and Government.	Can find suitable candidates to train Technology and approach will work. Government and NGOs accept new approach
Outputs A group of researchers capable of carrying out similar mapping exercises in other parts of the country and in the future as reconstruction commences.	Example maps of habitats for three selected areas Example maps of changes in habitats in the three areas 1991 to 2001.	Ground truth verification. Uptake of maps and expertise by stakeholder community. Extension of work methods to other areas.	Methodology works and produces an output that is "fit for purpose"..
Activities University identifies suitable trainees	trainees found	trainees turn up.	suitable trainees exist
Stakeholders identify critical habitats	report from first workshop	report circulated to stakeholder community, Cambridge Conservation Forum etc.	agreement can be reached
"hard" and "soft" classification of multi-spectral data.	map	maps validated	suitable imagery exists (Dec-Feb period)
Biomass estimates (SAR)	map	maps validated	Biomass distinguishes "farm bush" before sensor saturates.
Texture analysis (SAR)	map	maps validated	Texture distinguishes primary from secondary forests
Combination of all data	map	maps validated	Combination "adds value"
Verify/ validate.	Report on validation. exercise.	validation possible	Maps "fit for purpose"
Dissemination	Response to competitions, number of newspaper reports	Quality of response to competitions, quality of reports in local papers.	Can produce meaningful approach