Submit by 21 January 2005

DARWIN INITIATIVE APPLICATION FOR GRANT ROUND 13 COMPETITION:STAGE 2

Please read the Guidance Notes before completing this form. Applications will be considered on the basis of information submitted on this form and you should give a full answer to each question. Please do not cross-refer to information in separate documents except where invited on this form. The space provided indicates the level of detail required. Please do not reduce the font size below 11pt or alter the paragraph spacing. Keep within word limits.

1. Name and address of organisation

Name: Martin Todd	**Address:** Dept Geography, UCL, 26 Bedford Way, London. WC1H 0AP

2. Project title (not exceeding 10 words)

Monitoring and simulating threats to aquatic biodiversity in the Okavango Delta

3. Project dates, duration and total Darwin Initiative Grant requested

Proposed start date: Jan. 2006			**Duration of project: 3yrs**		
Darwin funding requested	**Total** £188,441	**2005/06** £22,797	**2006/07** £63,089	**2007/08** £52,751	**2008/09** £51,204

4. Define the purpose of the project in line with the logical framework

Wetland systems are rich in biodiversity but are being degraded rapidly. The Okavango Delta (OD) in Botswana is one of the world's largest inland wetland regions. The delta is maintained by annual flooding of the Okavango River (from the highlands of central Angola) creating unique habitats with exceptionally high beta diversity. It is one of the WWFs top 200 eco-regions of global significance and the world's largest Ramsar site. This project (lead by Todd and mackay at UCL) aims to build capacity in key institutions involved in conservation of biodiversity in the OD, to assist in implementation of the Convention on Biological Diversity (CBD). This will involve an integrated, multi-disciplinary programme of (a) scientific research to develop baseline aquatic biodiversity characterisations (phytoplankton, macroinvertebrate and macrophyte assemblages) and their relationship with hydrological drivers, namely the hydroperiod (flood duration and frequency), and water quality; (b) training in methods of aquatic biological data collection, analysis and system modelling. This will enable for simulation of aquatic biological diversity responses to scenarios of future changes to basin climate and hydrology, which will be crucial to informing policy decisions for biodiversity protection/conservation within the Okavango Delta Management Plan (ODMP).

5. Principals in project. Please provide a one page CV for each of these named individuals

Details	**Project Leader**	**Other UK personnel (working more than 50% of their time on project)**	**Main project partner or co-ordinator in host country**
Surname	Todd		Ramberg
Forename (s)	Martin		Lars
Post held	Lecturer		Professor, Director of HOORC
Institution	University College London		University of Botswana
Department	Geography		Harry Oppenheimer Okavango Research Centre (HOORC)
Telephone			
Fax			
Email			

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

Yes. Roger Flower (ECRC, Dept Geography, UCL) received funding from the Darwin Initiative for 'Benthic diatoms in Lake Baikal'. (Ref: 162/5/093).

7. IF YOU ANSWERED NO TO QUESTION 6 describe briefly the aims, activities and achievements of your organisation. (Large institutions please note that this should describe your unit or department)

Aims (50 words)

Activities (50 words)

Achievements (50 words)

8. Please list the overseas partners that will be involved in their project and explain their roles and responsibilities in the project. Describe the extent of their involvement at all stages, including project development. What steps have been taken to ensure the benefits of the project will continue despite any staff changes in these organisations? Please provide written evidence of partnerships.

Partner 1. Harry Oppenheimer Okavango Research Centre (HOORC), University of Botswana, Botswana. HOORC are the primary partner in Botswana and much of the project activity will take place at HOORC. They will be responsible for field campaigns, laboratory analyses, collation of biological census data (taxonomic identifications and counts), development of Indices of Biological Integrity (IBSs) and statistical models, and hydrological simulations, integration with other projects. HOORC are an implementing agency within the ODMP with representation on the national and local steering committees. Within ODMP, HOORC have responsibility for data management, ecosystem research, stakeholder participation and training. They will provide a direct link between the Darwin project and the ODMP.
Partner 2. Conservation International (CI), Botswana. CI is the leading NGO involved in scientific conservation research in the OD and is a committee member of the ODMP. CI will provide support in field campaigns, lab analysis and taxonomic expertise with particular emphasis on macroinvertebrates
HOORC and CI have been closely involved at all stages of the project from development of a pre-funding project proposal to the final stage-2 proposal. The pre-project funding facilitated a 6-day workshop involving all partners during which the stage-1 proposal was written and a detailed draft of the stage-2 proposal produced. HOORC and CI are currently partners in designing a UNDP GEF funded project "Building Local Capacity for Conservation and Sustainable Use of Biodiversity in the Okavango Delta", and the Darwin stage-2 proposal has been tailored to maximise synergy with this initiative.

9. What other consultation or co-operation will take place or has taken place already with other stakeholders such as local communities? Please include details of any contact with the government not already provided.

Project development involved extensive discussion with representatives of the ODMP (including government departments and IUCN) and OKACOM. UK and host country partners have existing relationship with these agencies through previous projects. These agencies fully support the project (see letters of support) and will benefit directly from the training component. Stakeholder participation (including local communities) is a central component of the ODMP. Within ODMP, HOORC coordinates this component and undertakes research into socio-economic issues within the OD involving stakeholder participation. Crucially, in devising this Darwin project design we have drawn upon the extensive stakeholder consultation (communities and private sector) already conducted by HOORC for the ODMP and the UNDP GEF project on biodiversity in the OD. The project therefore addresses directly many of the issues raised during these consultations. During the period of the project it will continue to be influenced by the ongoing stakeholder consultation through the UNDP GEF project (Darwin project workshops will involve presentations by the UNDP GEF project). Therefore, through the involvement of HOORC we ensure that this Darwin initiative project has a direct link to the primary fora for stakeholder participation in management of the OD.

PROJECT DETAILS

10. Is this a new initiative or a development of existing work (funded through any source?) Are you aware of any other individuals/organisations carrying out similar work, or of any completed or existing Darwin Initiative projects relevant to your work? If so, please give details explaining similarities and differences and showing how results of your work will be additional to any similar work and what attempts have/will be made to co-operate with and learn lessons from such work for mutual benefits.

The proposed project is a new initiative. It is the first project to attempt to (i) comprehensively measure baseline aquatic biodiversity in the OD (with particular reference to diatoms, macrophytes and macroinvertebrates) and to develop Indicators of Biological Integrity (IBIs); (ii) define the relationship between IBIs and hydrology/climate; (iii) simulate the impact of climate change, potentially the greatest threat to the OD. A strength of the project is that it builds upon several previous/ongoing projects involving the team. The project will (i) utilise hydrological modelling tools and development scenarios developed under the EU funded 'WERRD' project and climate change modelling outputs from a UK NERC 'Dorothy Hodgkin' project; (ii) feed directly into the ongoing ODMP and OKACOM management processes (iii) provide an ideal complement to the UNDP GEF project on biodiversity in the OD. The GEF project starting 2005 aims to develop adaptive management strategies for local resource users in the OD. Co-operation will take place between the Darwin and GEF projects in data collection and IBI development. The Darwin project will provide a much more comprehensive analysis of aquatic biodiversity and specifically its relationship to hydrology and climate (the key drivers of the OD). The results will be of considerable value in informing the development of local strategies within the UNDP GEF project. Overall, the Darwin project will benefit from scientific knowledge and tools, infrastructure, resources, management experience and networks already developed. It will effectively lever resources already committed to research and management initiatives, and will add value to these. Moreover, this DI project will cement the relationship between scientific research on biodiversity and environmental management within the ODMP.

11. How will the project assist the host country in its implementation of the Convention on Biological Diversity? Please make reference to the relevant article(s) of the CBD thematic programmes and/or cross-cutting themes (see Annex C for list and worked example) and rank the relevance of the project to these by indicating percentages. Is any liaison proposed with the CBD national focal point in the host country? Further information about the CBD can be found on the Darwin website or CBD website.

Under its obligations to the CBD the government of Botswana has prepared the National Wetland Policy and Strategy (NWPS) and National Biodiversity Strategy Action Plan (NBSAP) to ensure conservation of the OD as the principal wetland region. The National Conservation Strategy Agency (NCSA) is the focal point of the CBD and Ramsar convention and has initiated the OD Management Plan (ODMP) as the primary response. Guided by the NWPS the ODMP is a multi-sectoral programme that adopts the ecosystem approach of the CBD, and is the key initiative for sustainable development and poverty alleviation in the OD. The ODMP provides input to the overall management of the Okavango River system through the tri-nation Permanent Okavango River Basin Commission (OKACOM). This Darwin project will strengthen the capacity of key institutes involved in the ODMP and crucially will raise the profile of biodiversity conservation within the ODMP. Through the ODMP the project will also provide an input into the development by OKACOM of an integrated River Basin management strategy. It has the support of both ODMP and OKACOM. It will also provide scientific rigour to the development of indices for resource-user monitoring in the UNDP GEF Wetland Biodiversity project, which will achieve the first resource management systems to 'mainstream' biodiversity into the productive sectors. The project will assist implementation of articles 7 (15%) 12 (15%), 14 (10%), 16 (5%), 17 (5%), 18 (2.5%), 10 (2.5%) with particular emphasis on inland waters biodiversity (15%), climate change and biodiversity (15%), indicators (10%), sustainable use (5%).

12. How does the work meet a clearly identifiable biodiversity need or priority defined by the host country? Please indicate how this work will fit in with National Biodiversity Strategies or Environmental Action Plans, if applicable.

The Okavango is the last near pristine river system in Africa. The NWPS and NBSAP both identify the OD as a top conservation priority. The NCSA identifies that the system is under pressure from (i) unsustainable development in both the river catchment (in Angola, Namibia and Botswana) and the delta region, including land use change (notably resettlement of up to 6 million people in post civil war Angola), dams, abstractions and tourism (ii) the impacts of climate variability and change. Diverse wildlife (including many endangered species) is dependent on the OD aquatic system, yet this field of research has been neglected, is poorly

understood and highly sensitive to changes in water levels. This Darwin project aims to directly address these large scale influences on biodiversity.

The ODMP is the primary relevant response to the CBD and Ramsar convention. The focus of the ODMP to date has been hydrology, land use and sustainable water use, with little direct consideration of biodiversity. This Darwin project will help rectify this. Because the ODMP is a long-term, ongoing, flexible process, continuous scientific research is required for the development, evaluation, and revision of planning decisions and interventions. This project will address critical needs highlighted in the ODMP Research Strategy: (i) acquisition of previously neglected baseline aquatic biological data and systematic long-term monitoring (ii) the development of predictive tools to inform decision-making, especially regarding the impact of hydrological/climate change. The project will strengthen the capacity of key institutes involved in the ODMP and the ODMP itself by ensuring that biodiversity is central to all planning and decision making.

13. If relevant, please explain how the work will contribute to sustainable livelihoods in the host country.

The OD provides vital resources for the livelihoods of the 150,000 residents of the area, as well as a vital source of national income through tourism. The Darwin project will contribute to sustainable livelihoods in two main ways (i) By building the capacity of the ODMP. The overall aim of the ODMP is to 'integrate resource management .. that will ensure long term conservation and .. benefits for the present and future well being of people' (NCSA, 2002). The ecosystem approach to management, which views the role of people as an ecosystem component, is a crucial aspect of the ODMP and as such that stakeholder participation is central. Appropriate policy for sustainable development is not possible without scientific assessments of the baseline biodiversity status of the OD and the impacts of future climate change/variability and development scenarios. This project will provide vital information on aquatic biodiversity to the ODMP process. (ii) By complementing and supporting the UNDP GEF project whose focus is directly on developing and implementing adaptive management strategies at the local level to ensure sustainable livelihoods. Much of the Darwin project scientific research will inform our understanding of sustainability in the OD.

14. What will be the impact of the work, and how will this be achieved? Please include details of how the results of the project will be disseminated and put into effect to achieve this impact.

Impact: (i) Indices of (aquatic) Biological Integrity (IBIs) developed and tested; (ii) Improved knowledge of aquatic ecosystem function in the OD and its sensitivity to hydrology/climate; (iii) Estimates of the impact of climate change and development scenarios on biodiversity; (iv) sustainable capacity building within local partner institutes including technology transfer and training to facilitate long-term monitoring and future research on biodiversity/hydrology/climate in the OD; (v) direct input of projects results into ODMP and OKACOM and UNDP GEF project; (vi) strengthening of ODMP process.

Dissemination: (i) Project reports distributed to DI, ODMP, OKACOM, UNDP GEF and Botswana national archives; (ii) presentations to technical advisory committees of ODMP and OKACOM; (iii) start-up and final workshops involving representatives from ODMP, NCSA and OKACOM; (iv) reports published as part of UCL ISSN series; (v) At least 4 publications in international scientific literature. These will all be joint authored by UK and host partners (vi) results presented at minimum of 2 international conferences; (vii) Press release of final results to local, national and international media; (viii) all data (biological, chemical, climate) to be included in HOORC/ODMP and UCL databases. This is accessible to all government departments. (vi) project web page, hosted at UCL, will allow worldwide access to all reports, papers etc. The biological data archive will be made available over the web once all the journal publications have been accepted. Distribution of the data will then involve an agreement that users offer joint authorship of any publications to the lead UCL and host partners. This will ensure that the partners retain joint intellectual property rights on data collected.

15. How will the work leave a lasting legacy in the host country or region?

The project will (i) Strengthen the ODMP process by building capacity within key institutes involved in ODMP and directly contributing to the development of sustainable policy and interventions (ii) Assist the host partners in developing sustainable future research and funding success by raising their national/international profile (e.g. through conferences and publications) and developing capacity and resources (high-level staff skills, data archives, state-of-the-art techniques and modelling tools) (iii) Enhance the success of other in-country initiatives such as the UNDP GEF project through the development within HOORC and other institutions of analytical capacity for freshwater environmental parameters (see Training, below) (iv) Lay the foundation for continued, long-term monitoring of biodiversity in the OD through training of staff at HOORC, CI and government departments (v) Improve the science base of Botswana.

We will ensure that not only key senior staff on permanent contracts are trained but that staff from a wide range of institutes and agencies receive training, as will students at the research level.

16. Please give details of a clear exit strategy and state what steps have been taken to identify and address potential problems in achieving impact and legacy.

The project builds on an existing long-term collaborative relationship between the UCL and the partner institutes. All the factors in section 15 above will help to ensure collaborative efforts continue once the Darwin programme has finished. Future collaboration will involve (a) further projects (e.g. WMO START proposal in June 2005 and EU proposal in Sept. 2005) (b) staff exchanges (e.g. Royal Society's Short Visits fund) (c) student exchanges at undergraduate and Masters level. HOORC as a regional centre for scientific research is expected to attract continued government funding and will continue to secure external funding to enable it to fulfil its mission and vision. HOORC fully recognise that aquatic monitoring of the OD is very important especially with regard to the collection of baseline data, as threats (identified above in Section 12 above) within the OD increase. HOORC have agreed to build into future research agendas funding for the continuation of selected monitoring sites established within this Darwin programme.

17. How will the project be advertised as a Darwin project and in what ways would the Darwin name and logo be used?

The project web page will be established and will display the Darwin name and logo in a prominent position on every page. All reports (hard copy and digital) will display the logo. All scientific publications will acknowledge Darwin Initiative funding. All conference presentations will display the Darwin logo on each slide. The project workshops will advertise the Darwin funding source to a range of key individuals at government level and international agency level. There will several press releases which will advertise the funding source. Because the project keys into established science research (UCL, HOORC) and management frameworks (ODMP, OKACOM) the Darwin logo will have wide exposure to decision makers.

18. Will the project include training and development? Please indicate who the trainees will be and criteria for selection and that the level and content of training will be. How many will be involved, and from which countries? How will you measure the effectiveness of the training and will those trained then be able to train others? Where appropriate give the length and dates (if known) of any training course. How will trainee outcomes be monitored after the end of the training?

Training is a central component of the project. We propose a suite of training initiatives: (i) Intensive training courses in freshwater ecology at UCL (advanced postgraduate level) attended by 2 HOORC senior staff. Year 1 (each 1 week): Freshwater invertebrate analysis, Macrophyte analysis, Diatom analysis. Year 2: Numerical analysis of ecological data (2 weeks). The senior HOORC staff will then impart their knowledge to other staff in Botswana throughout the project; (ii) Training courses at post graduate level by UCL staff conducted at HOORC in Botswana on ecological survey methods, field techniques, taxonomy, and advanced multivariate statistics for ecological surveys, unix computing and climate analysis/modelling. Total of 8 weeks training during 04/06, 08/06, 07/07, 04/08. Trainees: key staff in local partner institutes (8 from HOORC and 2 from CI) and government departments involved in the ODMP (4 officers from Fisheries section, Ministry of Agriculture, Dept. Wildlife and National Parks, Dept. of Water Affairs) and 2 UB masters students; (iii) 2 UB students will undertake Masters by Research in projects closely related this project; (iv) Training of UB winter school students, at which up to 10 students at advanced undergraduate level per year will be receive training from HORRC staff.

This training programme will serve several main purposes: (i) to enable collection and analysis of ecological data for use in the project; (ii) to build capability in partner institutes for long-term monitoring of biodiversity in OD; (iii) to build capacity in partner institutes to enable development of high-level research programmes, specifically in biodiversity and climate impacts. Further details of the training are provided in Sections 20 and 21. Monitoring of course outcomes will be facilitated through e.g. taxonomy harmonisation workshops at least once a year, together with regular communication via email and the project website. Effectiveness will be monitored through feedback evaluation forms and course assessment.

LOGICAL FRAMEWORK

19. Please enter the details of your project onto the matrix using the note at Annex B of the Guidance Note. This should not have substantially changed from the Logical Framework submitted with your Stage 1 application. Please highlight any changes.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: **To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve** • **the conservation of biological diversity,** • **the sustainable use of its components, and** • **the fair and equitable sharing of benefits arising out of the utilisation of genetic resources**			
Purpose Assist in the ability of Botswana to implement CBD in the OD region, through programme of capacity building, training and scientific research.	By end of yr 3: HOORC staff appointed and trained. New knowledge on (i) aquatic ecosystem functioning (ii) hydrological responses to future climate and development scenarios. Key IBIs and predictive models developed. Long-term biodiversity monitoring programme established based on IBIs Inputs to ODMP complete.	HOORC annual reports. Scientific publications. Joint partner project reports	Government remains committed to CBD, Ramsar, and National Wetlands Policy.
Outputs Acquisition of extensive baseline aquatic biodiversity and water quality data across hydroperiod gradients in OD.	Within 1st 6 months of project: Candidate field sites (up to 100 for contingency) identified from existing 15 year satellite derived flood maps and local knowledge. By mid Yr 2: Datasets of baseline aquatic biological diversity archived. Contributions to UNDP GEF Wetland Biodiversity project underway	Manual of field and lab protocols Data archive of biological and chemical data. Reports	Field sites accessible during periods of flooding.
Development of robust Indices of Biological Integrity (IBIs), sensitive to hydroperiod	By end yr 2 IBIs developed and tested, and statistical models relating IBIs to hydrology developed.	Workpackage report sent to Darwin Initiative. Publications.	HOORC Computing facilities maintained.
Development of future scenarios of OD flood frequency, extent and duration and biodiversity response	By mid Yr 3: Multiple 20 yr datasets of monthly river discharge and OD flood will be created using hydrological models, from scenarios of climate change/water abstraction. Initial prediction of resulting IBI.	Workpackage report completed. Scientific publications.	Matched personnel at UCL will remain in post.
Establishment of on-going systematic biodiversity monitoring programme based on identified IBIs.	Staff trained. Monitoring equipment procured. In yr 3 monitoring programme initiated.	Workpackage report completed and sent to Darwin Initiative.	Botswana government maintains funding for HOORC.
Dissemination of results	Datasets compiled in dual archive at HOORC and UCL, accessible to all. Project website established at UCL. Journal and conference publications submitted (min. 6). Press releases for local and international media.	Data archives documented Copies of all manuals, reports, press releases and publications sent to Darwin Initiative	Computer facilities at UCL are constantly maintained.
Training programme for staff at HOORC/IC & Botswana students completed.	Min. 8 HOORC/IC & 4 Government staff trained in key aspects of project science. Min. 2 HOORC academic staff trained in UK. 2 UB Masters by research in Yr 2. UB students trained during HOORC Winter School (up to 10 per yr).	Training manuals Training feedback reports Attendance records for training courses Master theses	HOORC staff remain in post, and the Winter School continues
Relationship of project to CBD established through ODMP initiatives.	Annual/final project reports produced for ODMP. Presentation at meeting with ODMP. Workshops at start and end of project (ODMP and stakeholders).	Workshop minutes, presentations and feedback compiled and sent to Darwin Initiative.	Reports will positively influence ODMP

	Report submitted to the tri-nation Permanent Okavango River Basin Water Commission (OKACOM).		
Activities	Activity Milestones (Summary of Project Implementation Timetable)		
Research	Yr 1: Identification of candidate study sites (up to 100) from historical 15-year satellite derived dataset of flood history, aerial photos and local knowledge. Sampling basin will be range of hydroperiod conditions. Yrs 1 & 2: Data collection from sites, laboratory analysis. Y2-3: Development of multiple high-resolution climate predictions (for 2030-50) using General Circulation and Regional Climate Models. Multiple 20-year hydrological model simulations over OD conducted, based on various (c 10) climate change and water abstraction scenarios. Development of IBI and statistical IBI models. Initial prediction of IBIs under hydrological scenarios.		
Training	Yr 1. Staff appointed at HOORC, equipment procured. Yrs 1-3: Training of Batswana staff in taxonomy, field methods, advanced numerical methods, computing and climate analysis. UCL staff will visit HOORC to deliver annual 1-week courses on each component, while key HOORC academic staff will visit the UK for specialist training. Senior undergraduate students from HOORC winter school trained each year. Yr 2: 2 UB Masters research projects		
Dissemination	Yr 1: Production of guidelines, training manuals, protocols and web site Yrs 1-3: Submission/presentation to ODMP. Attendance at conferences Yr 3: Submission of final results to international publications, ODMP, OKACOM and media.		
Management	UCL will retain overall responsibility for management of the programme. The establishment of a web site in Yr 1 will facilitate this. Project planning will be finalised at workshop at start of programme (Apr 2006)		

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

Project implementation timetable		
Date	**Financial year**	**Key milestones**
	Jan-Mar 2006 Apr–Mar 2006/07 Apr-Mar 2007/08 Apr-Dec 2008	
Jan – Mar 2006	Jan-Mar 2006	
Jan.		Appointment of HOORC technicians and Research Fellow Appointment of UCL Research Fellow Launch of programme website. Article submitted to UCL magazine UK Press informed of programme
Mar		HOORC RF visits UCL to attend training courses Purchase of equipment and major consumables
	Apr–Mar 2006/07	
Apr		Initial planning workshop to be held at HOORC, attended by all participants and representatives of government departments, including the NCSA (focal point of the CBD), and OKACOM. Botswana press launch of programme 1 UB Masters by Research studentship appointed Taxonomy training course to be held at HOORC to train staff and Masters students
Jul		Identification of up to 100 candidate sites for ecological sampling, based on analysis of satellite-derived hydroperiod (flood history) archive.
Aug		Production of training manuals and protocols
Aug		Field methods training course held at HOORC Sampling programme initiated: Fieldtrip 1 (UCL,HOORC,IC staff), followed by taxonomic identification and counting
November		Sampling programme initiated: Fieldtrip 2 (HOORC, IC staff), followed by taxonomic identification and counting
Feb		Sampling programme initiated: Fieldtrip 3 (HOORC, IC staff), followed by taxonomic identification and counting

	Apr-Mar 2007/08	
May		Sampling programme initiated: Fieldtrip 4 (HOORC/IC staff), followed by taxonomic identification and counting
July		Statistics for ecology, computing and climate analyses training course to be held at HOORC by UCL to train staff and Masters students
December		Key IBIs developed and statistical predictive models of IBIs and hydroperiod developed
		Database of high resolution future climate delivered from UCL to HOORC.
Jan		Work begins on creating multiple 20 yr datasets of future monthly river discharge and flood extent using hydrological models driven by future climate data inputs
	Apr-Dec 2008	
Apr 2008		Climate modelling and advanced statistics for ecologists training course to be held at HOORC by UCL to train staff and students
		Start of analysis to predict future biodiversity from simulations of future hydroperiod under climate change and development scenarios.
Sep 2008		Above analysis complete
Oct 2008		Final project meeting at HOORC Keynote presentation to ODMP and stakeholders Final project press releases
Dec 2008		Submission of final reports to ODMP and OKACOM
		Report submitted to Darwin
		4 Papers submitted to international journals
		Long term on-going monitoring program initiated

21. Set out the project's measurable outputs using the separate list of output measures.

PROJECT OUTPUTS		
Year/Month	**Standard output number (see standard output list)**	**Description (include numbers of people involved, publications produced, days/weeks etc.)**
Jan-Mar 2006	6A/6B	Research Fellow (RF, Motswana) from HOORC to be trained at UCL for 3 weeks in Freshwater invertebrate analysis, Macrophyte analysis, and Diatom analysis.
	15C	Press releases produced via UCL Press Office
Apr 2006–Mar 2007	4A/B	Ten UB senior undergraduate students to receive training at HOORC winter school (6 weeks duration)
	5	Two HOORC technical staff, two UB masters students and one CI consultant to receive training on field and laboratory techniques throughout the year. UCL staff and senior HOORC staff will supervise this throughout.
	6A/6B	HOORC/IC research staff and technicians (8) plus officers (4) from government departments will receive training by UCL staff in ecological aspects of the programme. These will cover (i) taxonomy of key organisms (ii) field sampling and monitoring techniques. 4 weeks duration
	6A/6B	Research Fellow (RF, Motswana) from HOORC to be trained at UCL for 2 weeks in advances numerical techniques.
	7	Training manual produced for each course. This will be in hard copy and in digital version accessible via project web page.
	8	UK staff will spend 9 weeks in host country
	10	2 Field guides and training manuals produced for (i) sampling biological organisms; (ii) water chemistry and hydrological measurements
	13A	A phytoplankton (especially diatom) species reference collection will be set up and archived at HOORC
	13B	Macrophyte samples collected will be added to an existing herbarium held at HOORC
	14A	Project kick-off workshop and initial planning meeting in Maun, Botswana. All partners and Key members of ODMP, OKACOM and government ministries will be invited to attend.
	17A	Email mailing group to be established for information dissemination. Will include all partner staff, students, ODMP members.
	15A & B; 18A; 19A	Local and National press will be invited to launch workshop of programme. Press release distributed

Apr 2007--Mar 2008	2	One Motswana Masters by research student will receive their degree based on Darwin project work
	4A/B	Up to ten UB senior undergraduate students to receive training at HOORC winter school (6 weeks duration)
	5	Two HOORC technical staff, two UB masters students and one CI consultant to receive training on field and laboratory techniques throughout the year. UCL staff and senior HOORC staff will supervise this programme throughout.
	6A/6B	HOORC/IC research staff and technicians (8) plus officers (4) from government departments will receive training courses from UCL staff in (i) advanced multi-variate statistics (ii) climate analysis. 2 weeks duration
	7	Training video will be produced from completed sampling and laboratory analysis programme. Training manual produced for each course. This will be in hard copy and in digital version accessible via project web page.
	8	UCL staff will spend 2 weeks in host country
	11B	At least two manuscripts will start to be prepared on various aspects of the ecological data, e.g. (i) spatial and seasonal distribution of biological indicators; (ii) their relationships to environmental variables and creation of predictive models
	12A	Database of climate change predictions (temperature and rainfall) at high resolution over Okavango basin for multiple timeslices in 21st century.
	14B	Preliminary ecological results will be presented at the UK British Ecological Society meeting
	Additional	Indices of Biological Integrity (IBIs) developed. Statistical models of relationship of IBI and hydroperiod defined.

Apr 2008-Dec 2008	2	1 Motswana Masters student will receive their degree based on Darwin project work
	4A/B	up to ten UB senior undergraduate students to receive training at HOORC winter school on ecology and climate analysis (6 weeks duration)
	5	Two HOORC technical staff, two UB masters students and one CI consultant to receive training on field and laboratory techniques throughout the year. UCL staff and senior HOORC staff will supervise this programme throughout.
	6A / 6B	HOORC/IC research staff and technicians (8) plus officers (4) from government departments will receive training courses from UCL staff in (i) advanced multivariate statistics (ii) climate modelling. 2 weeks duration.
	8	UCL staff will spend 2 weeks in host country
	9	1 habitat management plan will be made as a recommendation to the ODMP
	11B	4 papers to be submitted to international peer reviewed journals
	12B	Enhanced database of hydrological conditions (flood extent and duration) derived from suite of hydrological models driven by climate data from climate database. Ecological databases already held at HOORC and CI will be enhanced by data collected in this study
	14A	Project final workshop in Maun, Botswana. All partners and key members of ODMP, OKACOM, ODMP GEF and government ministries will be invited to attend.
	14B	We will present our results at international conferences, e.g. INTECOL International Wetlands Conference and relevant climate and hydrology conferences (e.g Royal Met. Soc. Annual conference)
	15A / 15C	Press releases will be made in both Botswana and the UK re. the major findings of the programme
	17B	UCL fully intend on continuing participation in OD monitoring and research, and will seek funds from other sources (e.g. WMO, EU, the Royal Society) to continue collaboration
	18A / 19A	final research results will be covered by the media in Botswana – HOORC have excellent links with TV and radio stations in Botswana
	18C	Currently discussion documentary on Okavango delta with Keo films for Channel 4
	20	£8000. 1 Linux PC. Software packages for advanced numerical analysis and regional climate modelling at HOORC, and reference material and slide storage cabinets. By end of project, 4-5 monitoring stations will be decided upon
	22	Matching funds c. 235k
	23	

MONITORING AND EVALUATION

22. Describe, referring to the Indicators in the Logical Framework, how the progress of the project will be monitored and evaluated, including towards delivery of its outputs and in terms of achieving its overall purpose. This should be during the lifetime of the project and at its conclusion. Please include information on how host country partners will be included in the monitoring and evaluation.

The project structure is designed to ensure that regular meetings and workshops will take place, involving all the partner institutes. The project will be managed by Mackay (ecological surveys and development of predictive models) and Todd (computing and climate modelling). However, local aspects, e.g. managing of fieldwork on a week to week basis will be undertaken by Ringrose and the RF at HOORC. We already have excellent email contact between the two centres, and this will improve. UCL/HOORC/CI will report weekly by phone, fax and email on the progress of each task. The internet will form a major part of the management, e.g. storage of data will be accessible through the project website. The project structure is designed to ensure that regular meetings, training courses and workshops will take place, involving all the partner institutes. It is at the workshops that major decisions will be made with regard to e.g. structure of the fieldwork, collection, storage and analysis of results, report and paper production. During every year of the programme, there will be exchange visits between UK and Botswana staff. All staff involved have extensive experience of successfully managing large international collaborative research projects.