

Darwin Initiative – Final Report

(To be completed with reference to the Reporting Guidance Notes for Project Leaders
(<http://darwin.defra.gov.uk/resources/reporting/>) -
it is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Darwin project information

| | |
|-------------------------------------|---|
| Project Reference | 14-017 |
| Project Title | Tool kits for the Sustainable Management of Ghana's Riverine Biodiversity |
| Host country(ies) | Ghana, Burkina Faso, Nigeria, Cote d'Ivoire, Togo, Benin |
| UK Contract Holder Institution | University of Liverpool |
| UK Partner Institution(s) | |
| Host Country Partner Institution(s) | University of Ghana |
| Darwin Grant Value | £188,816 |
| Start/End dates of Project | May 2005 – April 2008 |
| Project Leader Name | Prof. Edward Maltby |
| Project Website | http://pcwww.liv.ac.uk/aquabiol/Darwin_Ghana/ |
| Report Author(s) and date | Dr Conor Linstead, Prof Chris Gordon, Prof E Maltby, March 2010 |

1 Project Background

The project was undertaken with the Centre for African Wetlands at the University of Ghana but has also involved collaborators from Burkina Faso, Nigeria, Cote d'Ivoire, Togo and Benin. The project aimed to address the impediments that remain for Ghana (and its neighbouring countries) in applying the Ecosystem Approach (EA) to riverine wetland management and the delivery of the Convention on Biodiversity (CBD). Priority needs were identified as taxonomic capacity building, a contemporary assessment of the status of aquatic biodiversity in Ghana, the development of practical management tools for rivers and increased engagement of stakeholders in decision-making together with an enhanced environmental awareness throughout Ghanaian society. These were addressed in this project by regional and local staff training, reporting on the current status of aquatic communities, the production of educational and taxonomic resources for a range of users, the development of a set of nested indicators of ecosystem health adapted for use at various levels, and the production of a policy document outlining the means of applying the EA in the management of Ghana's rivers.

2 Project support to the Convention on Biological Diversity (CBD)

This project focussed on the first of the three main objectives of the Convention on Biological Diversity (CBD) i.e. the conservation of biological diversity, specifically by developing tools for the sustainable management of riverine biodiversity. However, in doing so this will contribute to the second of the main CBD objectives in that it will facilitate the sustainable use of the ecosystem services delivered by riverine ecosystems.

The project also has direct relevance for the inland waters biodiversity thematic programme of the CBD and contributed to cross cutting themes of:

- communication, education and public awareness (through contributions to the national biology curriculum (see Section 4.3))
- ecosystem approach (in particular, the development of the suite of indicators have been strongly based around the ecosystem approach (see Section 4.5))
- identification, monitoring, indicators and assessments (again, through the development of the set of indicators for widespread monitoring of riverine ecosystem status (see Section 4.5))

The training undertaken during the course of the project has helped to support Ghanaian institutions that are assisting with the implementation of the CBD. This is detailed below in Section 4.3 and Annexes 7, 8 and 9. This capacity building is likely to be continued in the future with the announcement of a \$ USD grant from the Government of Ghana for the development of a new Environmental Institute at the University of Ghana, which the main host country project partners are actively involved with.

The connection of the project with the Focal Point for the CBD has been strengthened in particular by inviting Prof Albert Oteng-Yeboah, a National Focal Point for the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD and Chairman of the National Biodiversity Committee to Chair the Public Meeting at the end of the January 2007 Workshop.

3 Project Partnerships

The main partnerships essential to delivery of the project are between the University of Liverpool, the Centre for African Wetlands (CAW), the University of Ghana, The Water Research Institute of Ghana and the Ghana Wildlife Society. These partnerships have developed over the course of the project through a number of joint workshops and training activities. The partnership was formed as a result of knowledge gaps identified by CAW during earlier work with members of the consortium. Previous studies by Prof. Gordon (the co-ordinator in Ghana) have shown that knowledge of stream biology in the tropics is patchy and taxonomy is of particular concern for lotic invertebrates in Ghana (Thorne, Williams and Gordon, 2000, J. of Freshwater Ecology, 15, 209-217). The Centre for African Wetlands (CAW) played a key role in the project delivery in Ghana and also played a lead role in decision-making in the project implementation in Ghana.

A key lesson learned with respect to partnerships is the need for UK staff to spend significant periods of time in the host country building and strengthening relationships. Several unavoidable changes in the management of the project in the UK resulted in a loss of momentum and the need to re-establish relationships with project partners and re-energise the project delivery.

4 Project Achievements

4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

This project was designed to facilitate the sustainable management of riverine biodiversity in Ghana through the development of appropriate tools and inputs to education and monitoring resources and policy development. As such there is only an indirect effect on biodiversity, sustainable use or equitable sharing. The important impacts of the project on biodiversity in Ghana, however, has been the contribution towards key policy documents via the Water Resources Commission, and the integration of an ecosystem approach within these policies. This is discussed further below in the context of the project outcomes.

4.2 Outcomes: achievement of the project purpose and outcomes

The stated purpose of the project was to promote '*the sustainable management of Ghana's riverine wetlands in accordance with the principles of the Ecosystem Approach*'. This was primarily achieved through the development of appropriate tools, based on an ecosystem approach, to enable stakeholder organisations to monitor the status of riverine ecosystems. This output will make a significant contribution to the management of rivers in Ghana as it provides a set of indicators and associated assessment scheme that can be easily quantified using the resources available at a local level to give an overall assessment of the status of a river. If a monitoring programme was implemented using these indicators it could provide valuable information for the management of river ecosystems in Ghana.

The contribution of the project to national policies relating to river management also helped to achieve the purpose of the project.

4.3 Outputs (and activities)

The following sections outline the progress made against each of the five outputs set out in the logical framework.

1. Training workshops held for staff.

The training delivered by the project was intended to build the capacity necessary in CAW staff to deliver the project objectives. The first workshop was held in January 2006. This was initially intended for 6 CAW staff but was this expanded to include a much larger proportion of the project staff (20 participants in total). This was partly achieved because of a change of emphasis from taxonomic training to more methodological training on applying the Ecosystem Approach to the assessment and management of aquatic systems as this has wider applicability to the group as a whole. A report of the workshop is provided in Annex 7.

Four Liverpool staff delivered further training to members of the Ghanaian project team on the draft toolkit during a week long visit in January 2007. The original intention was to provide further input into the first of the Regional Workshops for visiting scientists from Ghana's neighbours. However, in the event this could not be carried out as funding was not obtained in time. Further interactions, presentations and discussions of the scientific results were completed with the team members. As part of this workshop a wide group of stakeholders were invited to a presentation about the project and launch of the project website, which was reported in the local press (see Annex 8).

A third workshop was held on 4th & 5th March 2008. This was held as a joint initiative between this project and the START-PACOM project, which released the resources required to engage with a wider group of stakeholders from the wider region having participants from Nigeria, Togo, Benin, Cote d'Ivoire and Burkina Faso. This workshop included sessions on the Ecosystem Approach, wetland management, riverine buffer zones and capacity building for ecosystem management in West Africa. A report of the workshop is provided in Annex 9.

During January 2010 workshops were held with the project staff in Ghana on the use of the completed toolkit, preparing them for further dissemination of the outputs from the project.

2. Range of educational and taxonomic resources produced.

The project has provided input into the national Ghana Senior High School Elective Biology Curriculum. The full curriculum is yet to be approved by the Ministry of Education (due to a change in Government). Until the full curriculum is approved and accepted, the project team has been unable to contribute to the development of the teaching materials supporting the relevant sections of the curriculum. The teaching materials will be developed by the Ghana Education Service for the entire curriculum and the Centre for African Wetlands will be invited as experts to provide content and guidance for the two sections that have been outlined (Ecosystem Approach and water resource management). This will be a self-funding activity, as CAW will earn royalties from the sale of textbooks. Annex 10 outlines how these subject areas will be integrated within the wider curriculum.

Information sheets have also been prepared for each of the indicators developed as part of Output 3 that can be used as educational materials suitable for undergraduate level.

Keys for invasive plants and invertebrates have been prepared that will allow users of the indicator toolkit to identify species to an appropriate level for quantifying the indicators.

3. A nested set of indicators of ecosystem health produced.

A list of 20 indicators appropriate for a Ghanaian context have been produced in consultation with the project partners to enable the assessment of ecosystem status for Ghanaian rivers and to facilitate monitoring of changes in ecosystem status over time. The draft list of indicators was presented at the training workshop held in January 2007 for project staff and stakeholders and refined based on subsequent discussion. The indicators have been designed to reflect the whole-ecosystem perspective embodied in the Ecosystem Approach. Indicators reflect physical catchment descriptors (e.g. percentage of the riparian zone with natural or semi-natural vegetation), water quality parameters (e.g. pH, conductivity) and ecology (e.g. species

distribution of invertebrates). The indicators have been chosen so that the majority are quantifiable with limited resources although some still require chemical analysis or specialist equipment that are only available to larger institutions in Ghana.

The indicators are embedded within a spreadsheet tool designed in Microsoft Excel that assesses each of the indicators on a five-point scale from 'bad' to 'high' for a particular site, depending on the value for the indicator entered into the spreadsheet. The assessment of individual indicators is based on expert judgement and field data and the relationships between individual indicators and their assessment is presented clearly on a separate sheet so that the assessment is transparent and can be modified at a later date on the basis of new data. An accompanying hyperlinked set of documents give short (1-2 page) descriptions of the rationale for including the indicator in the assessment scheme, information of how to quantify the indicator and links to further information. An overall site assessment is also provided on the same five-point scale from 'bad' to 'high' using the criterion that more than 75% of the indicators must achieve a given category or higher for the overall assessment to achieve that category. This threshold was established based on the experience of an earlier project that members of the project team contributed to.

A simple database has also been constructed so that assessments for multiple sites can be stored and re-analysed easily within the spreadsheet tool. This facilitates the assessment of time series of data for a single site or comparisons across multiple sites.

Printouts of the spreadsheet tool and accompanying documentation are provided in Annex 11 and the indicator toolkit itself is included with the electronic version of this report.

4. A report on current status of aquatic communities in Ghana

A report was prepared early in the project on the status of aquatic communities in Ghana. This is attached as Annex 12 and a summary is presented in Section 4.5 of this report. Subsequent data collection for the project concentrated on the same sites covered in this initial report and has built on the understanding presented in it. This further work on the assessment of the status of aquatic communities in Ghana has been compiled in a series of draft papers to be submitted to a special issue of the West African Journal of Aquatic Ecology (see Annex 16). Included in Annex 16 is a letter from the editor of the journal confirming the agreement to publish the papers as a special issue. It is the view of the project team that this is a more appropriate dissemination route for the work of the project than a report, as it will reach a more targeted audience. The Journal has a distribution of approximately 200.

5. Policy document on the application of the EA in the management of Ghana's rivers

Through CAW, the project has contributed to the development of two key policy documents in Ghana by providing advice and commenting on draft reports. A Buffer Zone Policy has been published by the Water Resources Commission that aims to ensure that buffer zones around streams, lakes and other surface water bodies are maintained or developed in order to 'restore, conserve and maintain the ecological integrity, and to provide optimal socio-economic benefits of such designated areas'. Two of the stated objectives of this policy are: to maintain the ecological and life-support functions of buffer zones; and to ensure equitably and sustainable utilization and management of buffer zone conservation areas, which will contribute to long-term well-being of resident communities. Both of these objectives align with the objective of the CBD and are consistent with the Ecosystem Approach.

The project also contributed to the development of the National Water Policy of the Ministry of Water Resources, Works and Housing that is intended to provide a framework for the sustainable development of Ghana's water resources. Contributions were in the form of advice to the report authors and commenting on draft reports. A letter of support from the Water Resources Commission thanking the project for its contribution to these and other initiatives is attached as Annex 13. The policy documents themselves are attached as Annex 14 and Annex 15.

4.4 Project standard measures and publications

The project standard measures are quantified in the table in Annex 4.

4.5 Technical and Scientific achievements and co-operation

The research and technical work of the project was focused around delivery of Output 3 (a nested set of indicators of ecosystem health) and Output 4 (a report on current status of aquatic communities in Ghana). These two outputs represent significant achievements in understanding the status of aquatic biodiversity at the study sites and the preparation of tools to monitor and manage rivers in Ghana.

Output 3. A nested set of indicators of ecosystem health

An initial set of indicators were devised by the project co-ordinators (both UK and Ghanaian) and presented to the wider project members at the January 2007 workshop. The suitability of these indicators was discussed and, based on feedback, the indicators were developed further and refined to a finalised version. The indicators are intended to allow an ecosystem-based assessment of the overall condition of a river in a Ghanaian context. As such, they are intended to be relatively easily quantified using ecological field observations, simple measurements and ecological sampling. The indicator set also includes some water chemistry metrics but these have been kept as simple as possible and can be quantified using cheap and easily obtained equipment (e.g. temperature, conductivity). As a whole the indicator set encompasses catchment-scale indicators of disturbance, water chemistry and ecological indicators it reflects an Ecosystem Approach. The full set of indicators is:

1. Percentage of catchment still covered in natural/semi-natural vegetation (%)
2. Change in total runoff (%)
3. Volume of reservoirs within the catchment as a percentage of total runoff (%)
4. Percentage of bank length (500m section) on both sides still occupied by natural/semi-natural vegetation (%)
5. Concentration of available phosphate - P ($\mu\text{g/l}$)
6. Concentration of available nitrate – NO₃ (mg/l)
7. Concentration of available ammonium - NH₄ (mg/l)
8. Concentration of total suspended solids (mg/l)
9. Conductivity (percentage change) (%)
10. Dissolved Oxygen (percentage saturation) (%)
11. Temperature (difference from shaded stream) (deg C)
12. Biological (Biochemical) Oxygen Demand (BOD) (ppm)
13. Change in pH at standard time of day compared with pristine reference site (pH units)
14. Number of species of submerged native plants counted at site (e.g. podostemonads, bryophytes) (number)
15. Number of species of introduced plants counted at site (e.g. Pistia, Azolla) (number)
16. Percentage of benthic fauna that are that are other deposit feeders (%)
17. Percentage of benthic fauna (numbers, families) that are Plecoptera, Ephemeroptera and Trichoptera (%)
18. Percentage of benthic fauna (numbers, families) that are predators (measured on sorted samples) (%)
19. Number (and types where they can be identified) of fish species (test fishing at site or compiled by local people) (number)

20. Number of bird species recorded in standard time over 100m length of the river (assessed at site) (number)

For each of these indicators standards have been established that are used to assess each of them as bad, poor, moderate, good or high based on their value. The standards are based on field data, values in literature or expert judgement where no other information was available. However, the assessment scheme has been designed so that the standards can be modified later in the light of new information. As, even under pristine conditions, there is a longitudinal gradient in some of the indicators from headwaters to lowland streams, and there would be expected differences between catchments with different natural vegetation types (even if pristine), each site being assessed is categorised according to one of six types and there are differences in the standards used to assess the indicators depending on river type. The categorisation of river types is:

1. Forest catchment, headwater erosive;
2. Forest catchment, middle stage;
3. Forest catchment, lowland floodplain;
4. Savannah catchment, headwater erosive;
5. Savannah catchment, middle stage;
6. Savannah catchment, lowland floodplain;

Each indicator has an associated information sheet that gives the rationale for why the indicator has been included in the overall scheme, recommended measurement techniques and references for further information. The taxonomic resources to be delivered as part of Output 2 will be designed to support the quantification of these indicators. For example, invertebrate keys will be organised so that predators can be identified easily (Indicator 18).

The indicators are assessed using a spreadsheet tool, which automates the process of assigning a class to an indicator. The spreadsheet tool also has a simple database and interface to allow the data for many sites to be stored and assessed.

Once as many as possible of the indicators have been quantified and assessed (bad to high) and overall site assessment is made using a 75% threshold i.e. 75% of the indicators that have been assessed have to be within a given category or better for the overall site assessment to achieve that class. The 75% threshold was based on the output from the ECOFRAME (Moss et al. (2003) Marine and Freshwater Ecosystems 13) where a similar tool was developed. Screenshots of the spreadsheet toolkit and the indicator information sheets are included in Annex 11 and the electronic version is appended with the electronic version of this report.

The indicators and associated spreadsheet tool were tested at the project sites using data collected as part of the project on the ecology and water chemistry. The outcomes of the test application of the indicators are presented in Annex 16, as part of one of the papers produced from the project.

Output 4. A report on current status of aquatic communities in Ghana

Field sampling at four sites in each of three catchments (Densu, Birim and Ayensu) was undertaken by CAW staff to collect the data necessary to make an assessment of the current status of aquatic communities. The analyses and conclusions drawn from these data have been compiled as a series of papers that will be published as a special issue of the West African Journal of Applied Ecology. These draft papers are attached as Annex 16.

Disseminating the outcomes from the project as papers within a West African journal rather as a report was considered by the project partners to be a more appropriate dissemination route as it would mean that the outputs were more widely read and journals published within the region are more accessible to local scientists than European or North American journals. The West African Journal of Applied Ecology has a distribution of approximately 200 and is an appropriate target audience for the scientific outputs from the project

4.6 Capacity building

This project has increased the capacity within Ghana for further biodiversity work and ecosystem management by the training provided in the three workshops, as outlined above in Section 4.3. This has built capacity in the areas of ecosystem management, in particular integrating a range of physical, chemical and biological assessments within an Ecosystem Approach. By the completion of the project, this capacity building is expected to be demonstrated by the acceptance for publication of several papers from the project partners into the West African Journal of Applied Ecology. The project has also supported this capacity by catalysing inputs to several other initiatives within Ghana e.g. the additional activities outlined in Annex 13.

The capacity building within the project team has been demonstrated by the preparation of papers for publication that, once published, will contribute substantially to the career development of the authors within the University of Ghana,

4.7 Sustainability and Legacy

It is anticipated that the indicator toolkit is the project achievement most likely to endure as it has been designed to complement and enhance existing assessment tools for the assessment of rivers in Ghana through the integration of an ecosystem approach. There is increasing interest in the ecosystem approach in Ghana and, as reported above, it is being embedded within policy and education. The toolkit is a significant addition to the management tools available in Ghana and will be further developed and promoted by CAW and the Ghana Wildlife Service. The data collected by the project has also made a significant contribution to the baseline data available on river ecosystem status in Ghana and provides key information for the development of evidence-based policy in Ghana. More widely, the legacy of the project as a whole is to have made a contribution to the development of river ecosystem management Ghana through the engagement with the Water Resources Commission who, in Annex 13, stated that they 'expect that the processes started by the Darwin Project ... will be of continued benefit to the WRC'.

The project partnership will be retained and the links generated and enhanced by the project will be used as a basis to develop future joint projects. In the short term a collection of papers from the project will be prepared. The Publishers of the West African Journal of Applied Ecology have agreed to print a special issue on the Darwin Project.

5 Lessons learned, dissemination and communication

The key lesson to be drawn from the experience of the project is to ensure that, when developing tools for use in a developing country, such as indicator or assessment schemes, the context is taken into account and tools, indicators or metrics are appropriate for the level of resources that are available. The indicators suite developed for this project is intended to be adaptable so that an assessment can be made even where not all of the indicators can be completed. While water chemistry indicators have been included to ensure compatibility with other systems, emphasis has been placed on ecological indicators. Much more useful and accurate information of the state of a water body is obtained from land use and ecological observations. The resources developed to accompany the indicators are intended to allow the ecological indicators to be quantified with a relatively low level of resources.

Information relating to project achievements have been disseminated to key policy makers in Ghana and applied in the development of policy documents (see Section 4.3). Further dissemination activities will take place over the next few months until the finalisation of the project, including producing peer reviewed papers and presentation of the final toolkit to key stakeholders.

It is anticipated that project partners, particularly the Ghana Wildlife Service, will continue to disseminate the training and implementation of the toolkit.

5.1 Darwin identity

The Darwin logo has been used on all project outputs and presentations to external audiences throughout the project. A press release was produced for the January 2007 workshop, which outlined the project aims and objectives. Local reporters attended the official launch of the project website and it was reported in the local press (the Daily Graphic 11th and 12th January 2007). International news agencies also picked up on the press release, including mention of the Darwin Initiative, and it is still available online at <http://www.sciencedaily.com/releases/2007/04/070425091546.htm> and <http://www.physorg.com/news96719599.html>.

For the most part the Darwin Initiative was recognised as a distinct project with a clear identity. However, because of the funding constraints, the March 2008 workshop was jointly held with another project (SysTem for Analysis, Research and Training – Pan African Committee (START-PACOM)) but the Darwin Initiative was given equal exposure.

The project has been promoted widely at an institutional level in Ghana through the workshops and key Government Ministries and agencies are familiar with the Darwin Initiative as a result.

6 Monitoring and evaluation

Annex 1 and Annex 2 detail the achievements of the project against the indicators specified in the original proposal. There were no major changes to the project design or indicators over the course of the project. The main changes to the project were financial: the distribution of the project budget across budget headings was altered to take account of changed project circumstances and, with the agreement of the Darwin Secretariat, the project was extended over a longer period of time as a result of unforeseen circumstances.

The project output and purpose indicators set for the project were based around the achievement of certain outputs rather than outcomes or changes to baseline conditions, i.e. they relate to the delivery of training, educational and taxonomic materials and reports, and were therefore not subject to the collection of baseline data to determine if they have been achieved or not. However, the indicators were effective in focusing the project activity towards the outputs and were useful in aiding the project delivery.

The project has been subjected to some external evaluation in relation to Output 5 (*Policy document on the application of the EA in the management of Ghana's rivers*) where the inputs from the project have been evaluated by the Water Resources Commission prior to inclusion in the relevant policy documents.

6.1 Actions taken in response to annual report reviews

As agreed with the Darwin Secretariat, due to several unforeseeable difficulties with the project delivery, a draft of the final report was submitted in November 2009. This updated and final version of the report has addressed the comments made by the Darwin Initiative secretariat on the draft report. Since the draft report was submitted a number of additional tasks have been completed to finalise the project deliverables.

- 1 – Finalisation of taxonomic resources to support the suite of indicators
- 2 – Testing of the indicator toolkit at the project sites
- 3 – Work towards the dissemination of the finalised toolkit to key stakeholders within Ghana by the preparation of papers for a special issue of the West African Journal of Applied Ecology

Annex 1 Report of progress and achievements against final project logframe for the life of the project

| Project summary | Measurable Indicators | Progress and Achievements April 2007 - March 2008 | Actions required/planned for next period |
|--|---|--|---|
| <p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources | <p>Improved quality of riverine wetlands. Enhanced taxonomic capacity in Ghana and other V African countries. Integration of freshwater management into CBD implementation.</p> | <p>The project has established the status aquatic communities in some of Ghana's rivers and a methodology and assessment framework that can be applied to other rivers to enable better management.</p> | |
| <p>Purpose The sustainable management of Ghana's riverine wetlands in accordance with the principles of the Ecosystem Approach</p> | <p>Six project staff trained in year 1. Twenty project staff trained in year 2. Twenty regional scientists trained in each of years 2 and 3.</p> | <p>The planned training of the project staff has been achieved.</p> | |
| <p>Output 1. Training workshops held for staff.</p> <p>Activity 1.1 Workshop 1 (month 2) for 6 staff covering EA, macroinvertebrate, macrophyte and fish sampling and identification, physico-chemical techniques.</p> | <p>Activity 1.2 Workshop 2 (month 16) for 20 staff preparing project staff for stakeholder training (20 staff)</p> | <p>A total of 16 project staff and 4 associated students trained in year 1 (see Annex 7 January 2006 workshop report)</p> | |
| <p>Activity 1.3 Workshops 1 & 2 (months 16 & 28) for 20 regional scientists from 6 countries</p> | <p>Activity 1.4 Workshop 1 (month 16) on use of tool-kit. Workshop 2 (month 36) for dissemination.</p> | <p>Training and stakeholder workshops held in January 2007 (see Annex 8 January 2007 Workshop Outline)</p> <p>Single but larger workshop held 4th-5th March 2008 – 49 participants from 6 countries. (Annex 9)</p> | |
| | | <p>Workshop held for project partners on the use of the tool-kit January 2010 and the preparation of peer-reviewed papers for disseminating the project outputs.</p> | |

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| <p>Output 2. Range of educational and taxonomic resources produced.</p> | <p>Material will be reviewed by expert group, partners and others (e.g. Ghana Education Service). Distribution through existing networks (e.g. GWS).</p> | <p>This output has been partially achieved.</p> |
| <p>Activity 2.1. Production of materials for community groups, schools and water managers, including web-based keys, picture keys, school work sheets, posters and leaflets (months 30-36)</p> | | |
| <p>Output 3. A nested set of indicators of ecosystem health produced</p> | <p>Stakeholders trained in the use of tools. Tools field tested by stakeholders</p> | <p>Educational materials have been prepared in outline but until the full curriculum is approved and accepted, the project team is unable to complete the development of the teaching materials.</p> <p>Information sheets have been prepared for each of the indicators included within the toolkit that give a short introduction to each of the indicators and links to further information.</p> <p>Taxonomic resources to support the application of the toolkit (i.e. invertebrate keys that allow identification to appropriate level) developed</p> <p>Set of indicators has been produced and discussed with the project partners.</p> <p>A spreadsheet based interface has been produced that can be used to perform site assessments.</p> |
| <p>Activity 3.1. Prototype tool-kit (months 8-16). Final Tool-kit (months 8-33)</p> | | |
| <p>Activity 3.2. Testing by stakeholders (months 17-27)</p> | | |
| <p>Output 4. A report on current status of aquatic communities in Ghana</p> | <p>Manual peer reviewed. Publication by CAW agreed</p> | <p>Testing by stakeholders carried out in January 2010</p> <p>A report and series of paper have been produced (Annex 9, Annex 16).</p> |
| <p>Activity 4.1. Report accepted for publication by CAW (month 36)</p> | | |
| <p>Output 5. Policy document on the application of the EA in the management of Ghana's rivers</p> | <p>Document peer reviewed. Publication by CAW agreed. Disseminated to Ghana's CBD focal point.</p> | <p>The editor of the West African Journal of Applied Ecology has agreed to produce a special issue on this Darwin Initiative project. Draft papers have been prepared and will be submitted to the journal for peer review.</p> <p>Project has contributed to two national policies: Water Resource Commission's Buffer Zone Policy and Government of Ghana National Water Policy. (see Annex 13)</p> |
| <p>Activity 5.1. Document peer reviewed and CAW acceptance for publication (month 36)</p> | | |
| <p>Documents have been published by Water Resources Commission and The Ministry of Water Resources, Works and Housing.</p> | | |

Annex 2 Project's final logframe, including criteria and indicators

| Project summary | Measurable Indicators | Means of verification | Important Assumptions |
|---|---|--|---|
| <p>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</p> | | | |
| <p>Purpose The sustainable management of Ghana's riverine wetlands in accordance with the principles of the Ecosystem Approach</p> | <p>Improved quality of riverine wetlands. Enhanced taxonomic capacity in Ghana and other W African countries. Integration of freshwater management into CBD implementation.</p> | <p>Ghana's reporting to CBD. Institutional reports. Reports of training courses. Uptake of taxonomic materials.</p> | <p>Ghana maintains engagement with CBD. Trained staff remains in post.</p> |
| <p>Outputs 1. Training workshops held for staff.</p> | <p>Six project staff trained in year 1. Twenty project staff trained in year 2. Twenty regional scientists trained in each of years 2 and 3.</p> | <p>Attendance records. Results of assessments. Course reports. CAW's records of correspondence and resource use.</p> | <p>CAW's existing regional networks continue. Sufficient participants for regional workshop recruited (travel expenses will be paid by CAW)</p> |
| <p>2. Range of educational and taxonomic resources produced.</p> | <p>Material will be reviewed by expert group, partners and others (e.g. Ghana Education Service). Distribution through existing networks (e.g. GWS).</p> | <p>Material published and distributed to key stakeholders and partners. Copies sent to Darwin Initiative.</p> | <p>Partners remain committed to production of outputs. Stakeholders willing to receive resources.</p> |

| Project summary | Measurable Indicators | Means of verification | Important Assumptions |
|---|---|--|--|
| 3. A nested set of indicators of ecosystem health produced. | Stakeholders trained in use of tools. Tools field tested by stakeholders. | Attendance records for training courses. Results of field testing distributed to national/regional stakeholders/scientists/CBD focal point | Sufficient stakeholders recruited for testing and dissemination. |
| 4. A report on current status of aquatic communities in Ghana | Manual peer reviewed. Publication by CAW agreed | Published reviews. Copies sent to Darwin Initiative. | N/A |
| 5. Policy document on the application of the EA in the management of Ghana's rivers | Document peer reviewed. Publication by CAW agreed. Disseminated to Ghana's CBD focal point. | Published reviews. Copies sent to Darwin Initiative. Minutes of meeting with focal point sent to Darwin Initiative. | Focal point available for meeting. |

| Project summary | Measurable Indicators | Means of verification | Important Assumptions |
|---|---|-----------------------|-----------------------|
| Activities | Activity Milestones (Summary of Project Implementation Timetable) | | |
| Training of project staff | Workshop 1 (month 2) for 6 staff covering EA, macroinvertebrate, macrophyte and fish sampling and identification, physico-chemical techniques. Workshop 2 (month 16) for 20 staff preparing project staff for stakeholder training (20 staff) | | |
| Training of regional scientists | Workshops 1 & 2 (months 16 & 28) for 20 regional scientists from 6 countries | | |
| Training of stakeholders | Workshop 1 (month 16) on use of tool-kit. Workshop 2 (month 36) for dissemination. | | |
| Development of tool-kit | Prototype tool-kit (months 8-16). Final Tool-kit (months 8-33) | | |
| Testing of prototype tool-kit | Testing by stakeholders (months 17-27) | | |
| Production of educational and taxonomic resources | Production of materials for community groups, schools and water managers, including web-based keys, picture keys, school work sheets, posters and leaflets (months 30-36) | | |
| Production of report | Report accepted for publication by CAW (month 36) | | |
| Production of policy document | Document peer reviewed and CAW acceptance for publication (month 36) | | |

Annex 3 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

| Article No./Title | Project % | Article Description |
|---|-----------|---|
| 6. General Measures for Conservation & Sustainable Use | | Develop national strategies that integrate conservation and sustainable use. |
| 7. Identification and Monitoring | 30 | Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data. |
| 8. In-situ Conservation | | Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources. |
| 9. Ex-situ Conservation | | Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources. |
| 10. Sustainable Use of Components of Biological Diversity | | Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector. |
| 11. Incentive Measures | | Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity. |
| 12. Research and Training | 30 | Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations). |
| 13. Public Education and Awareness | | Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes. |
| 14. Impact Assessment and Minimizing Adverse Impacts | 30 | Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage. |
| 15. Access to Genetic Resources | | Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits. |

| Article No./Title | Project % | Article Description |
|--|------------------|--|
| 16. Access to and Transfer of Technology | | Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies. |
| 17. Exchange of Information | | Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge |
| 19. Bio-safety Protocol | | Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research. |
| Other Contribution | 10 | Smaller contributions (eg of 5%) or less should be summed and included here. |
| Total % | 100 | Check % = total 100 |

Annex 4 Standard Measures

| Code | Description | Totals (plus additional detail as required) |
|--------------------------|--|---|
| Training Measures | | |
| 1a | Number of people to submit PhD thesis | |
| 1b | Number of PhD qualifications obtained | |
| 2 | Number of Masters qualifications obtained | |
| 3 | Number of other qualifications obtained | |
| 4a | Number of undergraduate students receiving training | |
| 4b | Number of training weeks provided to undergraduate students | |
| 4c | Number of postgraduate students receiving training (not 1-3 above) | |
| 4d | Number of training weeks for postgraduate students | |
| 5 | Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above) | |
| 6a | Number of people receiving other forms of short-term education/training (ie not categories 1-5 above) | 66 (training in Ecosystem Approach, use of indicators and taxonomy) |
| 6b | Number of training weeks not leading to formal qualification | 25 |
| 7 | Number of types of training materials produced for use by host country(s) | 3 (spreadsheet tool, indicator information sheets, reports) |
| Research Measures | | |
| 8 | Number of weeks spent by UK project staff on project work in host country(s) | 11 |
| 9 | Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s) | |
| 10 | Number of formal documents produced to assist work related to species identification, classification and recording. | |
| 11a | Number of papers published or accepted for publication in peer reviewed journals | |
| 11b | Number of papers published or accepted for publication elsewhere | |
| 12a | Number of computer-based databases established (containing species/generic information) and handed over to host country | |
| 12b | Number of computer-based databases enhanced (containing species/genetic | |

| Code | Description | Totals (plus additional detail as required) |
|-------------------------------|--|--|
| | information) and handed over to host country | |
| 13a | Number of species reference collections established and handed over to host country(s) | |
| 13b | Number of species reference collections enhanced and handed over to host country(s) | |
| Dissemination Measures | | |
| 14a | Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work | 2 (workshops as described above) |
| 14b | Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated. | |
| 15a | Number of national press releases or publicity articles in host country(s) | 2 |
| 15b | Number of local press releases or publicity articles in host country(s) | |
| 15c | Number of national press releases or publicity articles in UK | |
| 15d | Number of local press releases or publicity articles in UK | |
| 16a | Number of issues of newsletters produced in the host country(s) | |
| 16b | Estimated circulation of each newsletter in the host country(s) | |
| 16c | Estimated circulation of each newsletter in the UK | |
| 17a | Number of dissemination networks established | |
| 17b | Number of dissemination networks enhanced or extended | |
| 18a | Number of national TV programmes/features in host country(s) | |
| 18b | Number of national TV programme/features in the UK | |
| 18c | Number of local TV programme/features in host country | |
| 18d | Number of local TV programme features in the UK | |
| 19a | Number of national radio interviews/features in host country(s) | |
| 19b | Number of national radio interviews/features in the UK | |
| 19c | Number of local radio interviews/features in host country (s) | |
| 19d | Number of local radio interviews/features in the | |

| Code | Description | Totals (plus additional detail as required) |
|---|--|---|
| | UK | |
| Physical Measures | | |
| 20 | Estimated value (£s) of physical assets handed over to host country(s) | |
| 21 | Number of permanent educational/training/research facilities or organisation established | |
| 22 | Number of permanent field plots established | |
| 23 | Value of additional resources raised for project | |
| Other Measures used by the project and not currently including in DI standard measures | | |
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Annex 5 Publications

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| Type * (eg journals, manual, CDs) | Detail (title, author, year) | Publishers (name, city) | Available from (eg contact address, website) | Cost £ |
|--|--|-----------------------------------|---|------------------|
| | | | | |
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Annex 6 Darwin Contacts

| | |
|---------------------------------------|-----------------------------|
| | |
| Ref No | |
| Project Title | |
| | |
| UK Leader Details | |
| Name | Prof Edward Maltby |
| Role within Darwin Project | Project leader |
| Address | |
| Phone | |
| Fax | |
| Email | _____ |
| Other UK Contact (if relevant) | |
| Name | Dr Conor Linstead |
| Role within Darwin Project | Team leader |
| Address | |
| Phone | |
| Fax | |
| Email | _____ |
| Partner 1 | |
| Name | Prof. Chris Gordon |
| Organisation | Centre for African Wetlands |
| Role within Darwin Project | Host country co-ordinator |
| Address | |
| Fax | |
| Email | |
| Partner 2 (if relevant) | |
| Name | |
| Organisation | |
| Role within Darwin Project | |
| Address | |
| Fax | |
| Email | |

