



**Darwin Initiative
Project 162/6/014
FINAL REPORT**

**Submitted by
Field Studies Council**



**and
Institute of Freshwater Ecology**



**Submitted by
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Field Studies Council
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**FINAL REPORT
*Conserving Vietnam's
Biodiversity through
improved water quality
assessment and monitoring***

1. Summary

- 1.1** The main goal of this three year project (1997-2000) was to introduce cost effective and sustainable approaches for Water Quality Monitoring (WQM) in Vietnam, thus also raising awareness of biodiversity and a commitment to protecting the related habitats.
- 1.2** The project involved two separate groups: scientists and professionals; and teachers and secondary schoolchildren.
- 1.3** The project consisted of five distinct phases: UK training; production of supporting materials; Vietnam based training; local projects; dissemination and national integration into water quality monitoring.
- 1.4** All phases were achieved with varying degrees of success. The main achievements are summarised in Section 2 below . Some, such as the training, education, projects and resource development, were very successful and often exceeded expectations; the least successful element was the adoption of bio-assessment WQM protocols by the Vietnamese government's agency responsible for this work, the National Environment Agency. This is mainly because of the competition from large funding programmes which are supporting physicochemical monitoring throughout Vietnam and the lack of time/resources to develop a large enough database to instil confidence in NEA managers.
- 1..5** The main priority for the future should be to strengthen the scientific base for the rapid bio-assessment protocol which will convince NEA scientists that this is a valid approach. This will only be achieved when a more substantial database is built. This is already happening because of the number of Universities and Colleges who are now using macroinvertebrate bioindicators for WQM following the Darwin Training courses. The availability of new identifications keys, manuals and education resources produced by this project are the critical elements which are making this possible (particularly the keys). Therefore, the impact and likely long-term sustainability of the WQM and bio-assessment approaches (using macroinvertebrates) is very high, probably leading to statutory national integration in the future.



2. Achievements

TRAINING

- The equivalent of over two years intensive training (114 weeks) was provided to Vietnamese colleagues.
- Over 100 different individuals from higher education, national parks, National Environment Agency, schools and education authorities were involved.



Identification work, Hanoi Course April 1998



Professor Mai Dinh Yen, Hanoi Course April 1998



Hanoi Course
April 1998



Dalat Course
July 1998

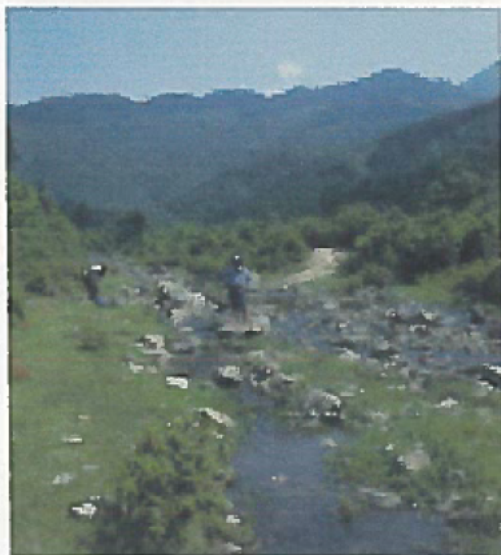




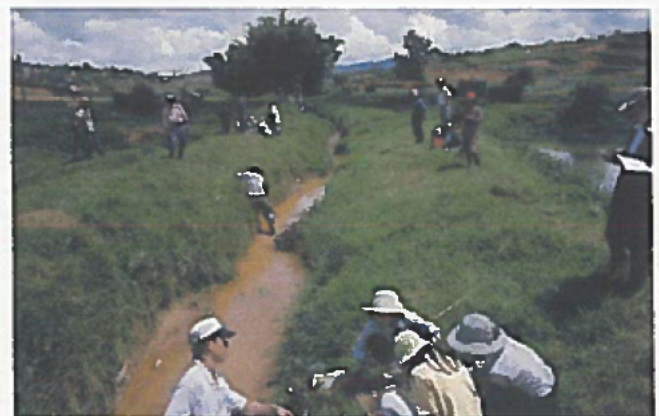
Lowland semi-urban site; Hanoi course fieldwork April 1998



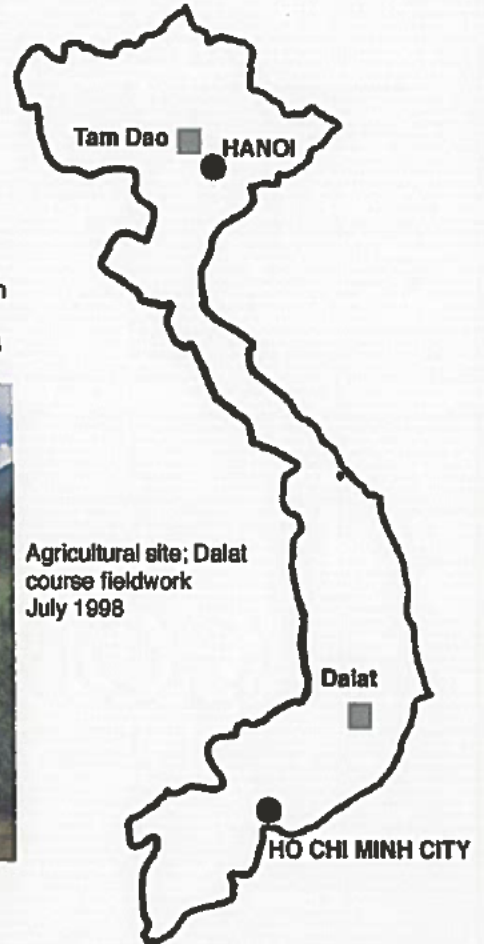
Agricultural site; Dalat course fieldwork July 1998



Tam Dao national park, upland site; Hanoi course fieldwork April 1998



Dalat suburbs, semi-urban site; Dalat course fieldwork July 1998

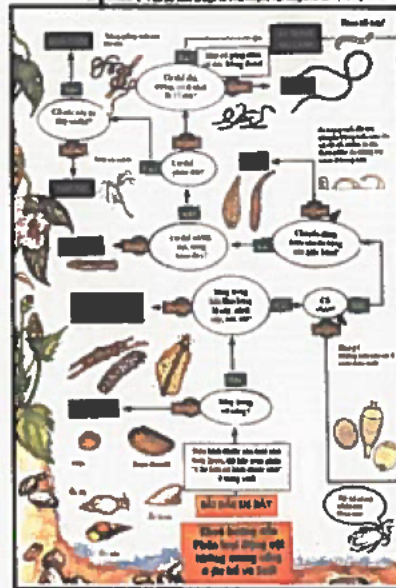
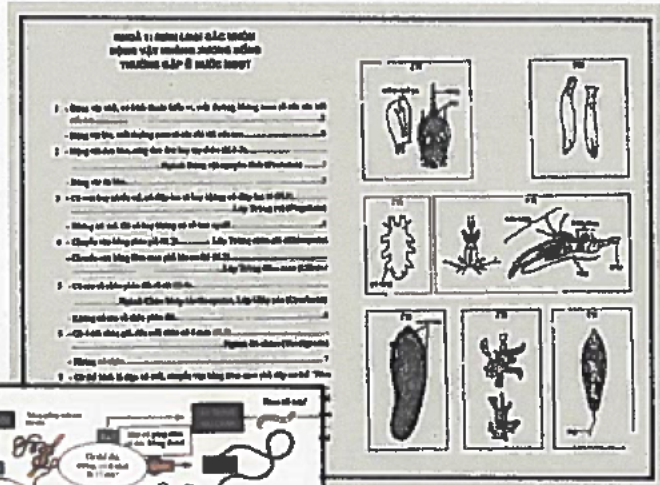


- Training was delivered in five different locations in Vietnam.
- Four UK staff spent nearly 23 weeks delivering the project in Vietnam.



RESOURCES

- Training manuals were produced for each of the three professional training courses and both education workshops (see Attachments 1-4).
- Two new Vietnamese language identification keys have been produced, aimed at beginners and professionals (see Attachments 5 & 6).
- A database and species collection has been established.
- A local monitoring protocol which includes local 'case studies' has been published (see Attachment 7).
- Over £4000 worth of books and equipment has been delivered to Vietnam.



NATIONAL INTEGRATION OF WQM BY NEA

- NEA involvement in the project was agreed at highest level.
- 22 NEA staff received the equivalent of 43 weeks of training.
- A provisional strategy for integrating bio-assessment protocols was agreed with NEA staff.
- Individual NEA staff have carried out local projects since thre DI courses.

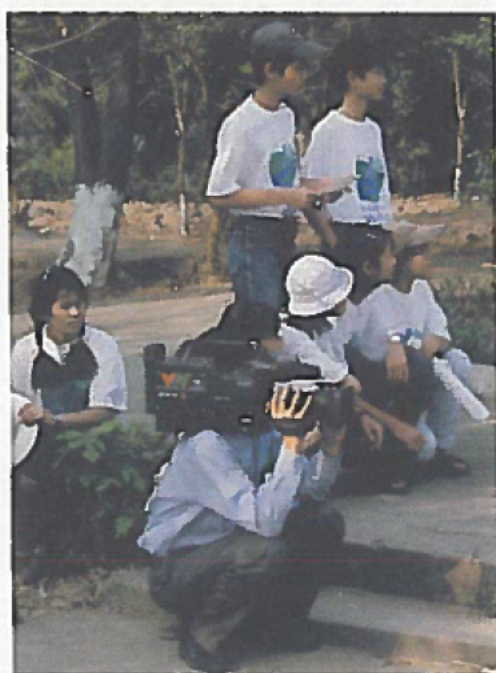
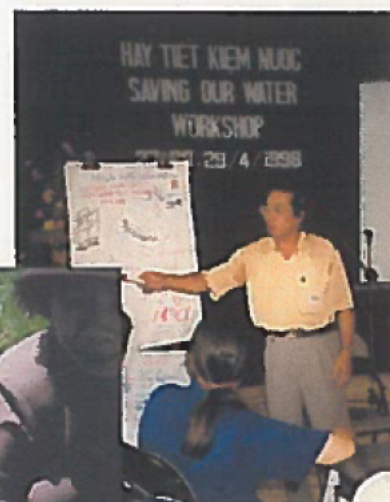
FURTHER AFIELD

- 6 weeks of training was also provided for colleagues in Thailand and Indonesia.
- The Darwin Initiative training and resources have seeded a major new community project in northern Thailand and a bilateral project involving communities bordering the Mekong in Thailand and Vietnam. Both are being funded by international donors.
- The results, keys and protocols have been launched and disseminated to 8 countries in Asia.



EDUCATION

- Over 35 BSc and MSc dissertations have been produced as a direct result of the Darwin Initiative training.
- Over 600 children were involved in schools projects.
- 500 copies of two Vietnamese education manuals have been published and distributed (see Attachments 8 and 9 *Vietnamese language*; 10-11 *English language*).
- 38 teachers received the equivalent of 21 weeks of training in three different sites.
- Water quality may become a curriculum 'theme' to be studied by schoolchildren throughout Vietnam.



SUSTAINABILITY

- The professional training courses trainees rated the training very highly (87% effective).
- Two years after the training the trainees still gave an high probability (86%) of the project work being sustained into the future.
- Teachers and schools involved in the training, projects and practical use of materials rated the present and future impact of the project very positively.
- National publicity on TV and in newspapers highlighted the high degree of interest in water quality and related issues; this will provide a foundation for local work in the future.



3. Project Details

3.1 Title

Conserving Vietnam's Biodiversity through improved water quality assessment and monitoring.

3.2 Project Background/Rationale

Vietnam's wetland habitats are of global importance for biodiversity. These are being subjected to increasing pressures, particularly from agricultural and industrial sources meeting the need of a fast growing economy and population. This has been recognised by the establishment of a national environmental monitoring network of twenty centres which monitor air, soil and water quality using physicochemical standards. The extent of the water quality assessment is restricted by financial, technical and training support; biological indicators are not used.

The project intended to establish a freshwater monitoring programme using biological indicator groups, and educational and publishing projects stemming from this. This was to provide a low cost but effective and powerful facility which would raise knowledge and awareness of water conservation and biodiversity issues concerning globally important wetlands and the terrestrial communities which depend on them. The project would provide a real collaborative opportunity to develop work both at community, schools (bottom up) and national (top down) levels, in a research and education area in which the UK excels. The global transferability of this expertise is proven. This project would build on a previous Darwin Initiative project and presented a unique opportunity to work at national level with full local support.

3.3 Project Objectives, Outputs and Implementation Timetable

The original application to the Darwin Initiative included five distinct phases, each with its own objectives. These are shown in Appendix I. Project outputs and timetable agreed with the Darwin Initiative are summarised in Appendices II and III respectively.

3.4 Project budget and expenditure

The agreed budget is shown in Appendix IV. All expenditure was within 10% of the budget allocations shown.



4. Review:

4.1 *Outputs and milestones*

The project outputs and milestones (in italics) agreed with Darwin Initiative (see Appendices II and III) were reviewed in the six monthly reports presented during the duration of the project; these also included commentaries and explanations. Sections in the annual reports for 1997/1998 and 1998/1999 which reviewed outputs and milestones are reproduced in Appendix V. A report for 1999/2000 is also included: a summary of the outputs is provided in Appendix VI and the overall achievements are illustrated in Section 2 above.

4.2 *Project review: Participants' and partners*

4.2.1 *Professional training*

4.2.1.1 *Training courses.* At the end of each of the three training courses a review was carried out. The results of the participants' reviews for the UK training course, Tam Dao (northern Vietnam) and Dalat (southern Vietnam) training courses are included in Appendix VII. All received very favourable scores, on average achieving over 87% of the objectives set by the project team and the participants.

4.2.1.2 *Overall.* Overall project reviews were carried out in June/July 2000. These were completed through: questionnaire surveys carried out through the Biology Department, Hanoi National University; telephone calls conducted through the Biology Department, Hanoi National University; 'field' visits by Dr Stephen Tilling (FSC) to six universities and colleges involved in the Vietnamese training courses during the period 31/7/200-3/8/2000; and a review meeting in Hanoi with five workshop trainees chaired by Dr S. Tilling (4/8/2000). Overall, these reviews covered the majority of the participants involved in the training courses. A summary of the main results is described below.

HIGHER EDUCATION: MOVING TOWARDS A SUSTAINABLE BASE

The higher education training was a great success. In part, this was due to extensive early face-to-face planning and very clear agreements which were always formalised through written 'contracts'. The major partners signed a Memorandum of Understanding (see Appendix VIII). However, the major reason for the success is that the university colleagues saw an opportunity to develop activities which were achievable within tight financial and administrative constraints but also met a number of educational, vocational and research needs. There were also clear opportunities for this work to generate additional contract work from Vietnamese and foreign sources; for example, the World Bank and DANIDA were both carrying out freshwater-related projects during this Darwin Initiative project and National University colleagues were invited to act as consultants. This is likely to persist into the future.



One of the project's collaborators, Dr Nguyen Xuan Quynh, has recently been promoted to Head of the Department of Invertebrates, National University, Hanoi. He intends to establish a 'Centre for Biodiversity Assessment and Monitoring'. He has already received a small amount of local funding [REDACTED] which has supported training of 10 final year undergraduates and 2 PhD students (one is on a six month placement in Korea to receive further taxonomic training in freshwater macroinvertebrate systematics).

Half of the participants on the two training courses came from universities and colleges. Almost all of these staff have used the training to introduce new teaching and to support graduate (mainly final year) and postgraduate projects. On average, at least two BSc/MSc dissertations have been produced by each college (5-10 in larger universities): at least 50 dissertations in total. A considerable amount of fieldwork has been carried out; during Dr Tilling's review visit he was shown records of fieldwork trips involving 100+ students.

Trainees were asked to rate the probability of this work being carried on into the future on a percentage scale (with 100 being very high: 0 being not at all). The average score was 86%, which indicates that there was a high degree of confidence that the work will be sustained in the future. A summary of main review comments (most were made several times) are given in Appendix IX.

A number of trainees said that further work was limited by lack of funds (mainly for travel) and the lack of central support from the NEA (see below). NEA support was seen as being very important in the long term. The creation of national bio-assessment standards would benefit the universities and colleges in three ways: the standards would provide credibility and, therefore, make it easier to justify related research; the universities would be expected to teach the new methodology and funding levels and line-manager support would increase as a result of this; and as NEA already sub-contract to some local universities to carry out physicochemical survey work it is likely that the new biological research/surveys would also be sponsored by NEA.

The absence of an officially validated (by experts) identification key and biotic index was also perceived as a problem during the courses. However, the new manual (which includes a biotic index for Vietnam) and keys have passed through the 'official' processes of scientific and administrative scrutiny in Vietnam. It is assumed that when the final Vietnamese-language versions are published later in 2000 they will become official 'authoritative' texts which can be used with confidence by Darwin Initiative trainees. Because of a backlog in the publishing schedule of Vietnam's educational publishing house (which publishes 'core' texts for educational and research use), the Vietnamese versions of the manual and key have not been published yet. However, both texts have been refereed and passed through the formal scrutineering by a scientific committee (a



formal process needed for all texts which are to be used in Universities). The University Publishers have confirmed (on 30/3/2000) that the texts will be published in 2000 (see numbers 38 and 39 on publishing list, Appendix X).

**NATIONAL ENVIRONMENT AGENCY:
STILL NEEDING TO OVERCOME SHORT-TERM OBSTACLES**

A. Short- to medium- term. In comparison with the very positive results in the teaching and research universities described above, the project has failed to achieve fully the targets set for the work in the National Environment Agency—the integration of a national bio-assessment strategy into water quality monitoring by the national network of NEA monitoring stations. This is despite NEA staff at all levels having been involved in project planning and implementation. The NEA Director agreed to support the project at its outset (see Appendix XI —Director’s letter of support) and 20 NEA staff were seconded to attend the two Vietnam training courses in northern and southern Vietnam. Half of the trainees were NEA staff. Also, Dr Ho Van, the Senior Officer in the NEA attended the UK training course and helped to deliver the first training course in Vietnam. Selection of NEA staff was through competitive selection after internal applications were circulated throughout the NEA nationally. All of this represented a very real commitment by NEA. An output from the training course was a proposed schedule for integrating bio-assessment into the national programme (see Appendix XII). This was accepted by NEA as a reasonable strategy at the time. However, reviews carried out during and after the project have shown that there was very little implementation, other than individual staff carrying out ‘ad hoc’ surveys with no significant or sustained support from the NEA head office in Hanoi (see below). There appear to be several interrelated reasons for this.

1. *Lack of national standards.* The main long term goal should be for measurable biological standards to be adopted in Vietnam’s environmental laws. Without these statutory standards it is unlikely that bio-monitoring will be adopted.
2. *Lack of data and uncertainty about the rigour of the protocol.* The knowledge base needs to be much larger, enabling Vietnamese freshwater scientists to apply freshwater biotic indices with confidence. This research is much more likely to be carried out through the higher education system (and, perhaps, through community groups) than government institutions such as the NEA. Vietnam is still a conservative country and will approach new ideas such as bio-assessment with relative caution. There is a short term tendency—particularly in national institutions— to adopt the ‘low risk’ approaches especially when these are



accompanied by large scale funding (see below)! There is no indication that NEA is prepared to fund this type of monitoring fieldwork in the short term.

3. *Seduction by knobs and dials.* There is a growing investment by overseas funding agencies in high tech approaches to water quality monitoring of physicochemical standards which are enshrined in Vietnam's environmental laws. This annual investment amounts to several million US dollars. The equipment involved is more prestigious than the humble pond net (the main tool used for bio-assessment)!
4. *Aversion to fieldwork.* A number of regional biodiversity reports have referred to the 'aversion' and/or lack of appreciation for the value of fieldwork particularly at management level. This had an impact on this DI project; it was difficult to recruit NEA staff with fieldwork experience for the training—many trainees were office based—and this will have contributed to the lack of fieldwork carried out by NEA staff after the training (apart from some notable exceptions; see below). The lack of skilled and committed fieldworkers seriously undermines the capacity to collect the data which are needed to secure the future integration of bio-assessment in national WQM protocols (see 1 and 2 above).
5. *Need for more training.* Several NEA staff asked for more training, particularly locality-based so that they could apply their skills locally with more confidence.

B. Long term. It is highly unlikely that the costs and training needed to maintain the high-tech physicochemical approaches to national monitoring in Vietnam can be sustained, particularly after the overseas funding ceases (as it inevitably will). This will present an opportunity for bio-assessment protocols to be adopted; by that time the database and assessment protocols will have to be extended and refined.

The project partners in Hanoi National University (and UK) are confident that the bio-assessment approaches used in the Darwin Project will eventually be incorporated into the national monitoring programme managed by NEA because the DI training provided for teachers, postgraduate students and NEA staff will help to achieve a 'critical mass' of workers who will eventually have an impact within NEA (see below). There is clearly a growing number of students with WQM training and skills emerging from the higher education system (see Higher Education review above). Also, some colleges and universities are contracted to carry out local monitoring for NEA and they may influence policy at ground level.

One of the conclusions from the project review carried out by National University was that although the majority of NEA staff may not have been able to carry out practical



implementation of WQM, a large number were young managers who were enthusiastic and that they would 'become significant when NEA accepts the new method of using bioindicators for water quality assessment as an obligatory procedure in the national standards for monitoring' (Dr Nguyen Xuan Huan, Dean of Biology Department, VNU, Hanoi; *pers. comm*).

Graduates and university staff are recruited into the NEA (though chemists are more common than biologists, reflecting the focus on physicochemical standards) and there is already evidence that junior NEA staff who have been involved in the training are experimenting with the new approaches. For example, two NEA participants (one from the Department of Quality Measure Standards ; the other from the Centre for Environmental Conservation) have applied the techniques in Lao Khai and Lamdong provinces in northern and southern Vietnam respectively, the latter as part of an MSc project. Both confirmed that although NEA were 'very happy' with the results they would not provide funds. Funding is critical, but If Dr Nguyen Xuan Quynh, one of our managing partners at Hanoi National University, succeeds in setting up a national Centre for Biodiversity Assessment and Monitoring, this will provide a focus for the education and training which will help to promote the development of bio-assessment protocols.

4.2.2 Education

Reviews of the two education workshops are included in the workshop manuals (see Attachments 3 and 4). Participants' reviews were highly favourable and the loyalty and continuity achieved throughout the training, field projects and trials of the education books were indicative of the commitment and interest achieved through the workshops. For example, 35 schools took part in the three days of water quality monitoring (see Appendix XIII); this is a major commitment for schools that are constrained by time and curricula. The national publicity—which included children being interviewed for prime time news (see photos on page7)—was also a reflection of the interest in this project.

Overall project reviews were carried out in August/September 2000 through the Ministry of Education and Training (MOET). These were conducted through questionnaires and telephone calls. In total, responses were received from 32 schools. The teachers were asked to score the effectiveness of the project's materials on a 5 point score, with 5 being the highest score. The results of the reviews are included in Appendix XIV. The average score of 4.85 indicated a very high level of satisfaction. In particular, the following aspects were commended:

- The inclusion of practical water quality activities (particularly the pollution monitoring) which helped the teachers to introduce environmental education (EE) into their classes (EE is still new, and largely theoretical, in Vietnam).



- The flexible learning and teaching approaches used (active and student-oriented).
- The factual content.
- The raising of awareness and knowledge about water quality and its importance to local communities and the impacts that they have on water quality.
- Presentation and format, including teachers' notes.

Importantly, there were clear signs that the work will be sustained. The great majority (95%) of teachers said that they would use the materials again in a variety of ways both in classrooms and through fieldwork activities. The majority thought that the work could/would be integrated into the subjects that they teach. Several teachers referred to the 'sowing of a very sound motivation' and the 'potential impact' of this work, and that 'many schools had already introduced campaigns on environmental practices that applied some of the activities introduced in the pack'.

The pack was split into two: the first volume dealt with 'theoretical' aspects and practical advice for teaching EE; the second volume included all the practical information and activities for teaching water quality. The teachers were more enthusiastic towards the latter volume; this reflects a dearth of practical material for teachers. There were also requests for more local data, such as water consumption figures in Vietnam and some case studies of schools projects to be included.

EDUCATIONAL IMPACT: REACHING THROUGHOUT VIETNAM

The timing of the Darwin Initiative (DI) project was fortunate. The DI project coincided with a large UNDP environmental education project which is implementing EE provision in schools throughout Vietnam. Links were made between both projects and the UNDP team managed the educational management and contacts with local teachers and schools. The UNDP project is a high profile project managed through the Ministry of Education and Training (MOET) in Vietnam and, therefore, the DI/UNDP collaboration provided an 'official seal of approval' which enabled the DI project to achieve a level of impact that would have been difficult to achieve otherwise.

The UNDP project is now in its second phase and it seems likely that 'Water' will be an educational theme which is adopted for further development of resources and training in schools throughout Vietnam's schools. The DI books may become resources which are used to support this development.



In summary, the educational impact of the DI project has been significant at national as well as local level and is likely to be sustained well beyond the term of this Darwin Initiative Project.

4.2.3 Communities. There were two unexpected but very significant successes for this project, both of which were additional to the targets set in the original Darwin Initiative proposal.

IN VIETNAM

As a result of contacts made in Vietnam with DANIDA the Danish Funding Agency, two Vietnamese managers involved in a DANIDA water catchment project with the Vietnamese Women's Union joined the Darwin Initiative Ao Vua Education Workshop. The skills and approaches they learned have been adopted in their own community scale projects and may be extended to a bilateral project funded by the Rockefeller Foundation (see 3 below).

IN THAILAND

Additional funding from local offices of the British Council (BC) enabled an extra two participants to attend the UK training course. The outputs agreed with both BC offices (in Bangkok and Jakarta) was to develop two proposals to be submitted to potential sponsors aimed at developing local community water quality monitoring projects in Thailand and Indonesia. The Thai proposal was accepted for funding by DANCED, the Danish funding agency, and the \$1US million project involving schools and communities in a major catchment in northern Thailand is currently in its penultimate year. This is a powerful example of how Darwin Initiative funding has acted as a catalyst for securing other projects and funding (see Letter of Thanks, Appendix XV).

4.2.4 International dissemination. The results of the project were presented to the Asian Association of Biology Education and are being published in the *Proceedings of the Asian Association of Biology Education*. The launch of the English language manual and keys (see Attachment 7) took place at the AABE conference in Hong Kong (5/8/2000); delegates from 8 countries received copies; nearly all are biologists who are teaching and carrying out research in Higher Education (see list of recipients, Appendix XVI). This should ensure that the methodology developed in the DI project is disseminated in the most practical way over most of southeast and east Asia. A further 100 copies are being distributed to other locations in southeast Asia.



5. Recommendations and future priorities

Overall, the project was very successful and achieved most of its objectives. This was mainly because: the project was based on local needs which had been clearly identified through extensive local experience by a member of the UK team; we were building on previous projects; the scientific and educational competence of the UK team was recognized by the Vietnamese partners; all of the project management was planned and formalised in written documents; the Vietnamese team were practitioners, not theorists; we provided extensive training and support (but see below); all parts of the project were supported by written resources.

However, there are areas which could be improved in the future.

Post-course support and communication Embedding training into methods of working always relies on considerable post-course support. This is expensive and relies on very efficient communication between the UK and local managers, and trainees working in their own areas. As always, management overheads for this project severely underestimated the costs—staff time in particular—in doing this. Future courses should allow for extensive post-course support and contact time; good communications is critical in achieving this.

Cultural sensitivity and time available. Despite considerable experience of working in Asia, and preparatory work in getting high level government support, it is still possible to underestimate the obstacles which can be erected, often by bureaucracy, 'officialdom', short-term expediency and 'ownership' (intellectual, research subjects, research sites etc.). This Darwin project was very successful, but its main failure—lack of integration into national monitoring—was due largely to its inability to get its provisional results translated into official policy at the highest levels. In reality, this would only come when all scientific risks were overcome and this, in turn, could only be achieved by a much larger project over a longer period. This was a particular problem in Vietnam at this time because of the very high levels of foreign funding which is supporting concurrent 'lower risk' projects (accompanied by very shiny highly photogenic pieces of equipment!). Future projects must allow for these challenges which are being replicated in many parts of the developing world.

6. Acknowledgement

The UK and Vietnam teams would like to thank the Darwin Initiative for making this work possible. Thanks also to the many people in Vietnam and UK who helped in the training and field projects. One of our Vietnamese colleagues summed up the impact of this project by saying "this work will help me and my department in our work for many years". We all believe that it will have a lifelong impact on some people in this rapidly developing country.

