Environmental Issues and Environmental Education in the Mekong Region

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on Environmental Education
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RECOMMENDATIONS OF THE SEMINAR

- That a Mekong region Environmental Education Network be established and supported by a regional EE Committee (one member from each of the countries participating in the Seminar, with overall management of the network and committee to be undertaken by CRES).

- That a Newsletter of the UNESCO Chair in Environmental Education at CRES be established to communicate to the regional EE network. This is to be coordinated by CRES with input from the Mekong region and Australia.

- That the Newsletter be quarterly and include material and news on:
  * individual country initiatives on EE
  * notices and reports on conferences
  * notices and reports of training programs in the region
  * sharing details of EE curriculum development and materials
  * profiles of EE institutions in the region
  * reports on major environmental issues emerging in the region
  * relevant newspaper articles and other news items from the region.

- That the possibility of short (3 to 6 month) environmental training courses be explored, perhaps in cooperation in with international and regional funding agencies, such as UNESCO, ADB, UNDP, UNEP, and GTZ.

- That joint regional training and research projects be established.

- That the nature, desirability and possibility of Mekong regional conventions on environmental protection be explored (including EE).

- That the Mekong region EE network seek cooperation with UNEP and UNDP programs.

- That Phase II of the UNESCO Teacher Education program be encouraged as much as possible.

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OPENING REMARKS

Dao Trong Thi
Vice-President
Vietnam National University
Hanoi

Distinguished Guests, Ladies and Gentlemen.

First of all, on behalf of the Vietnam National University (VNU), Hanoi, I would like to welcome all of our foreign and Vietnamese guests, professors, scientists, friends and colleagues to this very significant “Regional Seminar on Environmental Education” under UNESCO’s kind financial support and assistance.

As you might be aware, the issues of environmental protection and sustainable development have become global, regional and national concerns, and multi-disciplinary issues that have received special attention from all nations and ethnic communities.

For Vietnam, the environmental problem has become more urgent and serious especially in the market economy in which the environmental knowledge and awareness of people from all walks of life are still weak, and environmental management and monitoring is incomplete and loose. The best protection would be that people and authorities at all levels are very aware of the problem. Environmental education and training is the ideal instrument for such consolidation of knowledge and awareness.

The Law on Environmental Protection was approved on 10 January 1994 by the Vietnamese National Assembly. This law regulates the environmental education and training among people. This means that special attention has been paid to environmental education and training by the Vietnamese Government, by mass organizations and individuals at home and overseas, especially by universities and colleges.

Under UNESCO’s financial sponsorship, this Regional Seminar is organized in order to:

- Exchange experience in environmental education and training among Mekong River Basin countries; and

- Facilitate coordination, assistance and cooperation in environmental education and training, especially in the training of trainers among Mekong River Basin countries and other regional countries;

I believe that this Seminar will make a worthy contribution to the environmental protection education and training of various forms in Vietnam thus facilitating the environmental protection, education and training for the benefit of all. We are particularly grateful to Dr Wang Yibing of the UNESCO Regional Office in Bangkok for his inspiration behind these developments from the very beginning.

I wish all of you good health and wish the Seminar great success.

Thank you very much for your attention.
INTRODUCTION

Wang Yibing
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Bangkok

and

Le Trong Cuc
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There is growing awareness of the role played by higher education in any sustainable development programme. Universities and other higher education institutions are crucial for the creation, transfer and application of knowledge as well as for the training and retraining of highly qualified professional and managerial staff and for the advancement of education at all levels and of all forms. If this is becoming generally clear it is already particularly so for Environmental Education. The Environment, since the Brundtland Report of 1989 and the UNCED Conference in Rio de Janeiro in 1992, is now regularly coupled with, and seen in terms of, sustainable development.

Accordingly, it is appropriate that a UNESCO Chair in Environmental Education was recently established in the Asia and Pacific Region of UNESCO. It was located at the Centre for Natural Resources and Environmental Studies (CRES) at Vietnam National University (VNU) in Hanoi because this centre had already established a reputation for work in the fields of environment management and environmental education. The siting of the Chair at CRES also strategically places it in position to make a particular contribution to the six countries that share the Mekong Basin, and whose representatives make up this Seminar.

The key emphases in UNESCO's thinking about higher education have shifted from Quality, Relevance and Efficiency to Quality, Relevance and Internationalization. The UNITWIN / UNESCO Chairs Program is a key initiative in this regard, being designed to develop university networking and other linking arrangements among higher education institutions at the inter-regional, regional, and sub-regional levels. The Chair in Environmental Education at VNU is among ten Chairs in different fields that were created throughout the Asia and Pacific Region in 1994-5, and it is expected that six others will be established in 1996-7.

The first occupant of the Chair in Environmental Education is Professor Paul Bishop, Director of the Graduate School of Environmental Science at Monash University in Victoria, Australia. His appointment with the support of Monash immediately gives the Chair a Regional character as it is indicative of the desire between CRES at VNU and Monash to share experience in the teaching of Environmental Science at the postgraduate level and to look forward to joint research in their shared fields of interest. Thanks to further support from Monash, Emeritus Professor Peter Fenesham has been able to join Professor Bishop as a Co-Chair for the period surrounding the first Mekong Basin sub-regional Seminar, the proceedings and outcomes of which are reported in this volume.

In the Seminar reports were presented from the six countries of the Mekong Basin - Myanmar, Thailand, Cambodia, Laos, Vietnam and Yunnan Province, China. All these reports have mentioned environmental situations that indicate that there are commonly shared environmental issues and concerns, as well as ones

\footnote{After the opening and closing remarks, respectively, of Dr Wang Yibing and Dr Le Trong Cuc.}
that were very differentially experienced among these countries of the sub-region. Population growth, forest loss and land degradation were among those in the common list, and the loss of forest habitat inevitably results in loss of genetic resources. Air and water pollution, waste water and solid waste disposal have rapidly increased to extreme levels in the more developed situation of Thailand, and are looming as serious problems in Vietnam as its transition from a centrally planned economy to a market one proceeds in its urban and industrial areas. In four of the countries the current damaged state of the environment has been particularly affected by war and the continued existence of millions of land mines in one makes any moves to repair this damage an extremely hazardous operation.

The commonalities and diversities in this sub-region that shares the Mekong river as a fundamental resource provide a base of great potential for cooperation in matters to do with the environment and the response that education makes to it in environmental education. The existing common problems mean that the sharing of educational experience and of training programs are very obvious forms of possible cooperation. The fact that some of the countries, and particularly Thailand, have had experience of environmental problems that are only just, or not yet quite visible on the horizon of some of the others on their development paths, means that there is great potential for the latter to learn from the former how to plan development in an environmentally sustainable sense.

Each country has already initiated a number of education and training programs in the levels of tertiary or higher education that are related to aspects of the environment. In various ways and to varying degrees, each of the countries has responded to the problems of the environment with Environmental Laws and Regulations, and with associated political and institutional initiatives. However, in all countries, the development of persons with the conceptual understandings and skills that these regulatory intentions require for implementation and management lags well behind what is needed. Just as the environmental education of these administrative personnel needs much more attention so to does environmental education at every other level. Many types of professionals are still engaged in developing projects that will accelerate rather than minimise environmental degradation. The blinkered nature of their technical expertise may make them unaware of these wider social and biophysical consequences. As far as the general population is concerned, there is still a sense that environmental problems are things that happen to us, rather than that each of us in our own ways contributes to these problems. Without the environmental understanding implicit in the second of these formulations, efforts at environmental education in the public domain are often unsuccessful and fail to give people the knowledge and skills they need. There is some recognition of environmental education in the levels of schooling in each of the countries but this is greater at the primary level than at the secondary level. Much needs still to be done in the training and further development of teachers in both these levels so that they acquire the rather different knowledge and pedagogical skills that are needed so that the opportunities for schooling to contribute to wide-spread environmental consciousness are really taken up.

This seminar is an initial activity of the UNESCO Chair in Environmental Education in collaboration between the Vietnam National University, Monash University and the countries of the Mekong River Basin. A number of important key questions of environmental education have been identified. In the future, it is essential that, together, we continue with a series of activities in environmental education to achieve a better understanding of resource management and environmental protection in the region and how education can best contribute to these fundamental aspects of sustainable development in all our countries, and in the Mekong Basin region as a whole.

The thanks of all who participated in the Seminar go to UNESCO for its initiative in establishing the Chair, and hence its financial support for the Seminar; Monash University also kindly provided financial support for the initial activities of the UNESCO Chair. Special thanks of a different, but most important kind go to Mr Vu Quyet Thang and his team of assistants, who took such great care over the organisation and administration of the Seminar and its participants.
ISSUES AND DIRECTIONS FOR THE ENVIRONMENT
AND ENVIRONMENTAL EDUCATION

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Issues

The principal issues distilled by the Seminar are summarised overleaf, and the educational responses to them on the following page. The great range of issues is striking, reflecting, particularly, the varying degrees of industrialisation of the countries of the Mekong region. Thus, some countries report little or no industrial pollution to date, while others are experiencing very serious impacts from industrial wastes and effluent. This range of issues added considerably to the richness of the discussion and highlighted the major opportunity for the less industrialised countries to learn from the other countries’ experiences and to avoid repeating them.

The discussion of the educational and other responses to these environmental issues repeatedly noted their complexity and the need for a multi-sectoral and interdisciplinary approach to dealing with them. Making such rhetoric real, however, in a rapidly developing region in which certain sectors will be strongly attracted to modern technocratic approaches to environmental issues remains a major challenge. The implementation of large technological programs of monitoring and assessment is a necessary part of environmental management, but it is not sufficient of itself. The comfort it provides to environmental bureaucrats who use their monitoring programs to demonstrate that they are ‘doing something’ provides little comfort to people displaced or otherwise negatively affected by environmental damage and degradation. That is, the full social and technical dimensions of environmental issues must always be key elements of our programs. We touch on this again in a later part of this chapter.

Organisation of this report

This Seminar proceedings is organised into three sections. Part I presents country summaries of the environmental issues of the Mekong region. The papers of Part II comprise country reports of the educational responses to these environmental issues, with an emphasis on a generalised statement on current responses. Part III then provides examples of specific educational responses and initiatives, particularly at the tertiary education level, but with several examples towards the end of the proceedings drawn from community education. This emphasis on tertiary level education reflects one of the UNESCO Chair’s briefs, namely to assist with the development of environmental education at the postgraduate level in Vietnam and the region. Accordingly, Australian experiences have been drawn on by the Chairholders in the papers that report their contributions.

The papers were edited by Fensham and Bishop from the papers supplied by the authors; in a few cases these papers have been split into two sections corresponding to Parts I and II. The paper on community education in Vietnam was produced by combining two separate presentations.
ENVIRONMENTAL ISSUES OF THE MEKONG REGION

- Deforestation
- Population growth
- Agricultural impacts
- Domestic waste water and solid waste
- Soil erosion
- Decreasing biodiversity
- Industrial pollution
- Lack of regional cooperation - transboundary issues
- Land degradation
- Lack of public awareness and consciousness
- Rapid economic growth and rural-urban migration
- Coastal zone management
- Multidisciplinary/interdisciplinary issues (at policy and operational levels)
- Regulation lagging behind legislation
- Lack of linkages between micro- and macro-levels
- Energy use
- Rural-urban linkages in environmental issues
- Gap between economic development and environmental education
- Issues of ethnic minorities - preservation of cultures during rapid economic development and growth of tourism
- Conflicts and war
- Watershed management: erosion, socio-economic development
ENVIRONMENTAL EDUCATION ISSUES
OF THE MEKONG REGION

EIA in all professional education

General education should include
- family planning/overpopulation issues
- impact of overpopulation in natural resource depletion
- rational utilisation and protection of natural resources & biodiversity
- principles of sustainable development & its implementation

EE staff development at all levels

Curriculum design

Cooperation between Science, Technology, Environment & Education authorities

Communication skills (trainers of trainers)

Interdisciplinary team work

EE should generally be required of all

Need for large funding amounts to fund EE developments

Necessity for cooperation and networking

EE in primary and secondary teacher education

Place of EE in traditional educational structures:
- disciplinary v. interdisciplinary
- assessment (individual v. team-based assessment)
Directions

Introduction

When the papers of the Seminar and the discussion of them are taken as a whole, it is possible to identify a number of directions for environmental protection and for environmental education. A single country report often does not reflect the dynamic nature of these directions. Rather, a single country report is like a snapshot of how things are. How they came to be, and what they will, or could, be in a few years time are not described. We can, however, take advantage of this Seminar, in a spirit of internationalization, to extract from the various experiences of these Mekong region countries some common points among these various environmental directions.

Publicity to Consciousness

Scarcely a day passes in Vietnam without references in its daily press to environmental matters. The same is now true in each of the countries represented in the seminar. So the Environment is news. It is no longer fighting for publicity, at least not in the print media. As far as television is concerned, this type of publicity about the Environment may in fact be in decline. National reporting finds itself increasingly in competition with, and being by-passed by, internationally generated entertainment and advertising, that preclude the attention and responsibilities that local developments with environmental significance were previously given.

Publicity is necessary but publicity alone is an insufficient condition for a public response to environmental issues. Environmental publicity needs to move on to environmental awareness, where the issues publicised are, in fact, known about by a large cross-section of the community concerned. The formal school systems in the Mekong region have all acknowledged their responsibilities in relation to this shift from publicity to awareness in the case of their students who will be the citizens of the 21st century. To varying extents they have taken steps to implement this responsibility, but each acknowledges that much still needs to be done.

There is, furthermore, quite a substantial body of evidence that the sort of knowledge about environmental issues that schools most easily transmit tends to turn them into objects of study and not matters of concern and commitment to change. The paper by Tan Chengjie at the Seminar describes education that combines knowledge and skills of environmental issues with concern and commitment as "environmental consciousness", thus establishing a further point of direction from publicity beyond awareness. Persons with environmental consciousness have, in each of the roles they play in society, assumed a sense of responsibility for the current and future state of the environment, and have the knowledge and skills to act for its good health.

Remedy to Prevention

So many development projects in the Mekong region have had deleterious effects on the environment, that it is not surprising that most of the environmental action has hitherto been of a rear-guard remedial type. Attempts to alleviate or repair damage retrospectively are small comfort for those whose resources and way of life have been irreversibly lost. A major step beyond remedy has been environmental legislation, requiring an assessment of the likely impact a program or project will have on the environment (an EIA), before final approval is given for it to go ahead. The pressures for development in the region are very great and the beneficial effects of EIA legislation in the various countries of the region has been much reduced because of a lack of trained personnel to carry out these assessments and to monitor subsequent adherence to the approved project conditions. EIAs are not easy to do and the difficulties associated with
them are further complicated by the fact that the whole concept of environmental impact is still evolving. Almost any operational list of criteria for EIA can be added to by critics who have themselves been through the process of trying to convince developers and the affected public that adequate account of the local environment is being taken.

The tertiary educational response in the region has certainly begun to shift its priorities so that more training for EIA monitoring is occurring. For the foreseeable future, however, it is clear that the highest levels of EIA expertise will not be in sufficient supply to cover the initial and on-going assessments that will be needed. Accordingly, it is of great importance that the education of EIA personnel at every level of this training include a "Communications" or "Train the Trainers" component so that their education can have a multiplier effect. The conceptual ideas behind EIA need to be shared as widely as possible, and become part of the thinking of project staff and local citizens as projects proceed and become operational.

Another important step from Remedy to Prevention would be achieved if the concepts and operational procedures and implications of EIA were to become a mandatory part of the education of the wide range of professionals who are being educated in the region's institutions or overseas. In this way the development projects with which these graduates will be associated in the future would have some hope of being designed in a manner that includes environmental standards and safeguards from the beginning. Several courses for professionals were reported in detail at the seminar that now include units that link the major discipline to the environment in the sense of the "type 1" courses described by Bishop at the Seminar. If the suggestion to include EIA learning could be acted on, these courses would move to the more desirable "type 2" category.

The need for EIA personnel is being addressed in two of the countries where considerable experience in education of this type has already been acquired. There is thus a great opportunity for regionalization of this expertise if these centres of expertise can start to include persons from the other countries in the region. There is so much commonality of development projects and ideas about environmental protection in the region that this transfer of training should be very effective.

The proposed Masters Course at CRES in Vietnam National University that was presented at the Seminar moves a further step towards prevention by having as its prime foci environmental planning and management. Adding these targets to monitoring opens up the prospect of another new type of 'proactive' professional who will be equipped for, and concerned with, future choices for environmentally sustainable development, rather than with acting on a stage where the damaged and deteriorating state of the environment, and 'reactive' environmental repair, hold the central place.

**Technocratic specialization to Socio-technical co-operation**

Technical experts have often shown a willingness to address environmental issues and problems in the region. They have, however, often been disappointed by the short term nature of their suggested solutions, and by the reversion to old damaging behaviour that occurs when the constraints and encouragements of the technical solutions are removed. Accordingly, there has been a slow but growing recognition of the social/economic factors that are so intertwined with these environments that they interact unfavourably with technical solutions alone. The operational response has had to go beyond the technical and include procedures that enable the range of these other factors to be exposed, and allow for processes for decision making that are inclusive of the community's interests and perceptions of what is being proposed. The 'technical' has to be communicated, adapted and recast, sometimes repeatedly, until it harmonises with the 'social' in ways that are acceptable and positive for all concerned. Only in this way have really lasting resolutions of environmental issues been achieved. These experiences in the region challenge its patterns of technical and technological education. To be positive contributors to the environmental situations, the graduates will need combinations of technical and social learning for which there are as yet only a few
examples - the courses in Agriculture at Khon Kaen University in Thailand are relevant examples that were reported in the Seminar.

Higher education is especially challenged by some of the insights from these socio-technical solutions to environmental situations. Almost by definition, higher education is an elite phenomenon. Its processes of teaching and learning are based on highly specialized and advanced knowledge. Students who succeed in acquiring this knowledge are socialized away from the thinking, styles of communication, and ways of knowing of most of the people in the community who are directly affected by environmental degradation. How to acquire environmental expertise and to retain the common touch is a direction that the environmental situation is asking of higher education. The critical role of field work and project engagement throughout students' courses of study may be the most positive approach being reported in those institutions that have as yet accepted the challenge. The importance of students' engagement in 'real' environmental project work with a true social dimension is thus reinforced.

It was also pleasing to note in the Seminar presentations that the shift in environmental education towards greater awareness of the social/technical dimension has led to name changes for several programs and departments. Thus, a Master of Chemistry program in Myanmar has become a Master of Environmental Chemistry. The Department of Soil Science at Khon Kaen University has become the Department of Land Resource and Environment. Thirdly, the new Master degree at CRES, VNU, will be a Master of Environmental Science in Planning and Management.

Education 'added' to Education 'included'

The World Conservation Strategy and a number of counterpart national strategies that have followed in the more developed countries acknowledge a role for education but only in an isolated or add-on sense. This is curious since the idea that environmental education should be intimately associated with environmental action was well established in international discussions well before the World Strategy was produced. Despite strong pleas from the environmental education community throughout the 1980s to remedy this isolation of environmental education from environmental action, the same pattern was evident atUNCED in Brazil in 1992. Education was an after-thought, and those groups in most effective communication with the victims of environmental damage - the NGOs - were largely marginalized.

There are two likely reasons for this reduction of the effectiveness of environmental education. The first has been touched on in the previous section. It is the continuing dominance of the technocratic view of the environment that still so largely holds sway through professionals who have been very narrowly educated in universities in the past. Furthermore, it is not just the narrowness of technical experts that leads to this outcome. It is also that so many senior bureaucrats have been educated in fields that are exclusively based in science and technology. In the face of the obvious biophysical aspects of environmental situations, these bureaucrats assume that the only grounds for solution must be the technical, thus abdicating the very contributions their own backgrounds could and should be making. The "two cultures" are still alive and separated in many parts of modern higher education.

One response that helps to break down this wall of isolation has been taken by some universities and institutes of technology. They require students in professional course to take a unit in Communication that sets out to develop their skills in reporting their knowledge of their own field of study (i) to colleagues, (ii) to peers in other disciplines, and (iii) to lay people and the public more generally. The interdisciplinary or multidisciplinary project work that is a major learning feature of some postgraduate work, such as that described by Bishop at the Seminar, provides a very good means of developing these communication skills.
The second reason is associated, ironically, with the recognition that governments have been giving to the environment. Since the early 1970s, Ministries of Environment have been established in most countries. They have been established alongside, and hence in competition for funds and responsibilities with, other longer-established ministries, such as those for primary resource fields (fisheries, forestry, mines, and agriculture) and secondary industry (energy, production, industry, and so on). Education is yet another ministry with responsibilities for the formal sectors of schooling and higher education. The governments of the Mekong countries will, in their own organisation of affairs, also, no doubt, both recognize and fragment their environmental situations in a similar way. The chapters in the various Conservation Strategies reflect this set of ministries and indeed this has often been how they have been drafted, reflecting not the complex social and biophysical interconnectedness of all environmental situations but the sectors’ discrete and disparate views of the environment. The tertiary and higher education sectors, much more than primary and second schooling, are very much concerned with the education of persons who will take up positions in these ministries in the future. However, these higher sectors of education are usually administered through a Ministry of Education, the canons of knowledge of which are far more disciplinary than is needed by, or suitable for, environmental education. This is a major reason why Bishop’s “type 3” courses are so rare at the undergraduate level. These courses hold out the hope that an adequate response is possible in higher education, but the spread of such courses may depend on Ministries of Environment exerting pressures that their types of interdisciplinary graduates need to be directly developed in higher education courses. The Mekong countries may be more easily able to obtain this level of inter-Ministry co-operation in higher education than is the case in the countries where universities are very conservative educationally and more independent of government. No examples of this co-operation or of such courses were reported, however, at the Seminar.

National to Regional Co-operation

Several examples of large scale programs in environmental education were reported at the Seminar. GTZ, ADB and UNDP are agencies supporting programs that aim at building up institutional capabilities for aspects of environmental education. In each case, the educational targets for these programs were ones that were reported as needs in at least one of the countries in the region.

There would thus seem to be a very strong case that the contributions these programs are making in the national setting become available at least to some key persons from other countries in the region. The UNESCO Chair has a primary responsibility to foster networking in the region, and it may be able to be used as the catalyst that will bring about this much more efficient regional co-operation in tertiary and higher environmental education.

Resource Use to Resource Management

Many examples of resource degradation were reported. For almost every recent success in the use of resources to meet a national or international market, there seemed to be a corresponding story of resource loss. Each product sold is really a resource sold or given away. High quality agricultural land finishes up under the concrete of a housing, shopping or factory development, or under the exotic, water-thirsty grasses of a golf course for rich international tourists. The methods of so much successful prawn farming aggressively destroy estuarine mangroves. The pollution from many industrial and domestic means of producing energy distracts attention from the gross inefficiencies in these processes and those in which the energy is used.

A few counter examples were presented which suggested that Resource Management is a way forward and needs to become the framework and re-educing message that shapes how production is conceived in the future. Only when the conservation of resources conditions our practice will we be equipped to make
the goal of environmentally sustainable development more than a glib slogan to be endorsed by all but achieved by none.

Each of the positive examples of resource management had associated with it an education program about the long term value of the resources in question and a skill development program so that the alternative practices were both practicable and acceptable.

Directional dilemmas

Two directional issues were raised in the Seminar that can only be as yet described in terms that are contradictory.

Countries, like most in the Mekong region, that are rich in natural and human resources and have weak environmental planning are very attractive to foreign investment. Investment has also been seen as attractive to these countries because it is a pathway to improved social/economic development. If this conjunction of resources and investment has success, then a measure of social/economic development is achieved, but at the tremendous cost of loss of natural resources and environmental degradation. Furthermore, that loss, together with the improved economic position or labour costs, mean that the conditions for further investment are lost. The experience of the countries in the region spans the whole spectrum of this scenario. The Seminar raised for its participants the dilemma of this environmental situation and the question of what the educational response to it should be.

Secondly, some very successful examples of environmental education and environmental action leading to improved environmental situations were reported. In each case, great care was taken to address the particularities of the social context of the situation. In a sense, these social factors define a unique situation, and recognising its uniqueness was a key to the successful outcome. An educational facilitator who is able and willing to listen to those who are involved and affected was a critical feature.

When the multiplicity of environmental situations facing any one of the Mekong countries is considered, there is an obvious interest in finding some generalised features in the successful experiences that might make them transferable to the many calling for attention. This is, however, a technocratic view of what had been acknowledged in its success as a situation in which the technical and social are so intertwined that they must be dealt with as a whole. It was beyond the Seminar to more than raise this dilemma.
Part I

The environmental situation in the Mekong region
THE ENVIRONMENTAL CHALLENGES OF VIETNAM'S DEVELOPMENT

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Introduction

In Vietnam, as in other developing countries, the process of development has caused ecological imbalances that jeopardize the natural resource base upon which the entire nation's survival depends. These ecological imbalances have been compounded by rapid population growth, limited conservation awareness, and lack of funding for environmental and socio-economic development projects.

In 1986, Vietnam entered a new period of socio-economic development characterized by a shift from a centralized planned economy into a market-oriented one. The liberalization of agricultural and industrial production, as well as the development of services and the opening of the country for foreign investment, the effort for industrialization, and the promotion of exports are all bringing to Vietnam relatively rapid economic growth. At the same time, Vietnam is being confronted with a number of very real trade-offs in its development objectives, particularly between growth and environmental problems.

Environmental issues

Vietnam, a country of over 33 million hectares and about 73 million people is faced at present with serious environmental problems such as deforestation, soil erosion, over-exploitation of natural resources, threats to ecosystems, depletion of genetic resources and increasing of environmental pollution. These situations are currently experiencing severe pressure from a rapidly increasing population. It is necessary, therefore, to foresee the environmental problems that development will inevitably bring, and to take the necessary precautions in advance to mitigate them by developing an environmentally sustainable development strategy.

We, in Vietnam, are aware of the fact that the future of the Vietnamese people and our welfare depend on our natural resources which have sustained us for thousands of years. We know, too, that we must develop and use some of these resources, but in such a way that it does not harm - but rather helps - the environment. As the door to economic investment opens to Vietnam, the challenge of developing our country - and at the same time improving the state of our environment - is more difficult than ever.

This task of developing Vietnam's rich resources in a sustainable way is the biggest and most important challenge Vietnam is facing today. Without a healthy environment and a sound agricultural base, we cannot have a healthy economy. Sustainable development and conservation must work hand in hand, or as we say in Vietnam, walk with two legs - that is, in harmony and agreement.
Population growth

Vietnam has two major problems: over-population and deforestation. In 1996, the population of Vietnam is about 73 million people, but we are trying to bring population growth down to zero as soon as possible. It is critically important that this be done now, and that all families are asked to limit themselves to having one or two children.

Deforestation

The other major problem which seriously affects most developing countries is deforestation. Many areas in Vietnam are eroded because of our country's growing demand for firewood and timber for construction, and the fact that we lost over two million hectares of forest to defoliation and bombing during our last war. Forty percent of Vietnam is now considered barren land, and natural forest cover has declined from 43% coverage of the country in 1943 to 23% in 1982 and 20% in 1996.

Recognizing that forest loss is the single most serious factor threatening the long-term productivity of the country's renewable natural resources, we are carrying out a major planting programme in order to re-green our war-scarred land and to correct the mistakes of rapid development. The aim is to reforest 40-50% of the countryside by the twenty-first century. In this way we hope to re-establish the ecological balance in Vietnam, to preserve biodiversity, and to do our part in delaying global warming.

To grow one or two trees is very easy, but to plant hundreds or thousands hectares of forest is not simple, especially under the conditions of compacted, leached earth and dry, blazing climate now found in areas that were once cool, moist and fertile.

First of all, we know that in order for any of our efforts to succeed, we must have the support of the local people, so we have to begin public awareness and agro-forestry training in local villages and schools. Throughout Vietnam, the villagers are setting up tree nurseries. Every winter, during our Annual New Year Festival, we celebrate the New Year with tree planting. All school students plant trees every year. Primary school students plant one tree, secondary school students plant two trees and high school students must plant and care for three trees.

Before 1985, when we first launched our National Conservation Strategy, we were planting only 60,000 hectares of forest annually - and losing 200,000 hectares. Today we are planting 160-200 thousand hectares of forest every year and our goal is to plant, as soon as possible, 300,000 hectares annually, even though this is not enough to compensate for ongoing forest destruction.

Many years ago, reforestation in Vietnam was based on the monoculture of timber, but there are few convincing examples of successful large scale and long-term tree monoculture in this country. After the war, Vietnamese scientists attempted to replant several species of indigenous trees destroyed during the massive defoliant raids. These initial trials failed. Today, several thousands of hectares of fast-growing trees are giving shelter to several species of Dipterocarp. Now we are starting to develop a village-level process for local people to produce large number of seedling of indigenous tree species for planting around villages, in adjacent areas, or for reforestation projects, without the need for setting up and maintaining orthodox tree nurseries.

Degradation of biological resources

The natural environment of Vietnam contains a great wealth of plant and animal species. These groups show a high degree of local distinctiveness, with many endemic species of great scientific
and economic interest. Vietnam is one of the parts of the world which has not yet been studied systematically, permitting in the past two years the discovery of two new large mammalian species - the Vu Quang Ox (Pseudoryx nghetinhensis) and the Giant muntjac (Megamuntiacus vuquangensis) - in Ha Tinh province, where some years ago a new species of pheasant the Vietnamese pheasant (Lophura hatinhensis) was also discovered. Other new species of large mammals are currently under investigation in Vietnam, with one described in only October 1994 - Pseudonovibos spiralis found in High Plateau Tay Nguyen by Volgang Peter and Alfred Feiler.

This rich heritage of natural resources can meet our people's needs today and in the future as it has in the past. But instead of guarding it, our people are over-exploiting and wasting this endowment in the name of economic development. Many species have now become rare, and some are in danger of extinction. Properly utilized and managed, the wild fauna and flora of Vietnam could be a very valuable and renewable resource, but the decline of the country's wildlife is occurring very rapidly.

Vietnam has made only limited progress so far in saving wildlife and its natural environment. Nonetheless, the Government started to establish nature reserves as early as 1962, when it declared the first national park at Cuc Phuong. Further extension of the reserve system was held up by the war, but has proceeded very quickly since 1980. A system of national parks and protected areas was proposed and 87 of them were approved by the government by 1986. Vietnam has recently established a number of special protected areas. These include Tram Chim Reserve in the Mekong Delta for the endangered Eastern sarus crane and Xuan Thuy Reserve in the Red River Estuary, the first Ramsar protected area in Vietnam or anywhere in Southeast Asia, and declared for migratory birds.

The most difficult tasks for protection of Vietnam's nature reserves and national parks now result from the presence of settlements of local people who are living inside these areas. These people carry out shifting agriculture, hunting, and forest-product exploitation for their survival, and hence present obstacles to protection activities. Since 1987, the government has carried out a policy of resettling these people outside park boundaries and providing them with basic necessities. This programme was initially undertaken in Cuc Phuong National Park and has already had some success. But experience has shown that cooperation with local residents and recognition of their needs is a more effective means of protection than relocation alone. A very successful program in community mobilisation for the protection of forest areas is described in Section 3 (paper by Vo Quy and Nguyen Hoang Tri).

**Urban development and pollution**

With the rapid economic growth and the acceleration of industrialization in the past several years, environmental pollution in Vietnam is becoming more serious. Urban and industrial areas are increasingly polluted by the growing number of motor vehicles; the expansion of existing industrial areas; the building of new factories and industrial parks; and the continued use of ageing machinery in old factories. A number of important questions concerning pollution control in large urban and industrial areas, such as the centralized treatment of sewage, dumping and burning of solid waste, and toxic waste treatment, have not yet been considered. The urbanization programme will have a severe impact on environmental conditions.

The intensification of agricultural production for both the internal market and for export is increasing the need for chemical fertilizers and pesticides, creating the risk of soil and water contamination in rural areas. The development of oil and gas exploitation, along with its transportation and processing, create the risk of marine pollution.
Without proper urban planning, long-term living condition in Vietnam's growth cities and their surrounding confines could be seriously jeopardized. This would entail both completing the development of standards for industrial pollution and effluent release, and completing the preparation of implementing regulations for the new Law on Environmental Protection, especially for environmental assessment and institutional responsibilities for environmental action and policy decisions. Following the promulgation of the law, regulations concerning environmental quality standards, environmental quality control and inspection, and environmental impact assessment will be issued.

**Solutions to environmental problems**

Since 1975, after thirty years of hard struggle for national independence, the Vietnamese people have faced further new challenges. The restoration of the country's damaged and degraded environment and the provision of the basic living conditions for a population of 55 million people impoverished by many decades of war have moved to the forefront. Thus far, the task of addressing environmental issues has been carried out in three phases. From 1975 to 1980, rehabilitation of environmental damaged caused by war was paramount. From 1981 to 1990, the focus was on resource identification and use, and environmental issues linked with socio-economic development and population growth. Since 1991, the emphasis has been on promotion of appropriate strategies for resource development and environmental management aimed at sustainable development.

In the new period of development, the task of environmental protection and sustainable development in Vietnam has become more complex and requires more efficient use of resources and environmental management. This, in turn, requires clear policies, strategies, legislation, educations, training, awareness building, and research and experimentation. It is also requires better technical tools, including GIS technology, for monitoring, control and information; all of these are seriously lacking in Vietnam. This situation could result in many difficulties for environmental management at the national level, as well as at the local.

In order to promote environmental activities, the University of Hanoi with the co-operation of different research institutions began, in 1988, a regular six-month postgraduate course on "Ecological Approaches to Resources Development, Land Management and Environmental Impact Assessment". Many short training courses and training workshops on EIA, Wetland Management, and Human Ecology in the Lowlands, Mid-lands and Highlands of Vietnam have been organised for trainers and practitioners. Through these training activities, more than 500 graduates of these courses are now actively participating in different research, teaching, management or advisory activities throughout Vietnam. The first one-year postgraduate course on "Environmental Management and Impact Assessment" started at the Vietnam National University, Hanoi, in November 1994 to promote the skill of scientists.

**Conclusion**

How to meet the basic needs and aspirations of the people of our country without destroying the natural resources? And how to restore and develop the deteriorated areas, improve the environment, preserve the country's resources in order to build a strong economy from one which is still poor? These are great and difficult tasks. Their fulfilment calls for a large scale plan based on the principles of ecology (conservation) and of economy (development).

We are concerned with the fact that the Vietnamese people's future and welfare depend on the integrity and productivity of the environment and resources.
The question is how to rely on the people to restore and maintain their own environment for their benefit, with a deep knowledge of the paramount importance of the task. To this effect, we must deepen the knowledge of the people in environmental matters.

As noted earlier, Vietnam is facing further upset of its already unstable environment, largely because of the ecological catastrophes caused by population pressure, poor planning and management, and the residual effects of war. By learning from other countries' experiences, and analyzing its own development models, Vietnam is now choosing a new form of development, concentrating on family planning and on a wiser and more rational use of natural resources, thinking out development targets in which environmental problems play a central role.

It is great and difficult task, but we are optimistic about future prospects, for we firmly believe that environmental catastrophes are not inevitable, that our country's basic resources are still able to renewed, and that the Vietnamese nation has in it enough strength, sense of discipline and talent to cope with those dangers which are now threatening it.

We think big, we think on a grand scale, but we begin small, and we work, step by step, believing that we can achieve our aim of sustainable development.
ENVIRONMENTAL ISSUES IN THAILAND

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Introduction

It is now two decades since the global concern for the environment led the world community in 1968, through the General Assembly of the United Nations, to plan for the World Conference on the Human Environment held in Stockholm in 1972. This unprecedented historical move marked the beginning of a global environmental consciousness expressed in the form of social action.

The 1970s witnessed the emergence of a new thinking: environmental management was not viewed simply as conservation and pollution control but also in terms of resource management that was crucial to sustainable maximum growth. Other new concepts also emerged, such as the identification and use of renewable and reusable resources and wastes and the energy crisis. The consciousness was simultaneously escalated by other supportive movements, such as those by volunteer citizen movements, the media and concerned industrialists.

One of the most significant outputs of the Rio Earth Summit in 1992 was Agenda 21. This is an aggregation of action plans at the global level, the aim of which are to effect a transition to sustainable development. Clearly if this is to be achieved more concerted action at national level will be required. This is recognized by Agenda 21 which, in Chapter 8, requests each national government to “adopt a national strategy for sustainable development”. Capacity building is also stressed, and section IV of Agenda 21, “Means of Implementation”, specifically refers to the need for education, public awareness and training. Strengthening the staff in tertiary level institutions, designing appropriate curricula, and ensuring access to high quality teaching materials are important steps that must be taken if these educational targets are to be achieved in a time of transition in Thailand.

This paper presents an overview of environmental issues in Thailand as a prelude to the subsequent discussion of the status of Thai tertiary level environmental education and training.

An overview of environmental issues in Thailand

Thailand, like many other developing countries in Asia-Pacific Region, is beset with environmental problems, arising mainly from events concomitant with its rapid changing socioeconomic structure. Efforts to diversify the country’s agriculture and develop other industries have resulted in high economic growth, quadrupling real Gross National Product and more than doubling average per capita income in the last two decades. The annual growth in Gross Domestic Product (GDP) is more than 8%. Industrial development has made beneficial contributions to the overall economic development of Thailand. The average annual growth rate of industry for the period 1980-92 is 10.1%.

This accelerating economic growth was matched by extensive depletion of Thailand’s natural resources, the country having used these natural resources as principal production inputs. The decelerated pace of development of these traditional economic mainstays has already taken place over recent years and the role of the manufacturing sector has increased.
Light industries such as food and textile are currently dominant, but the petrochemical industry, based on natural gas from the Gulf of Thailand, as well as heavier industries, such as motor vehicle assembling and parts manufacturing, are increasing their share of the whole economy. Without proper management this leads to serious environmental problems resulting in water pollution, air pollution, noise and vibration, and generation solid wastes and hazardous and toxic substances. The worsening environmental condition in recent years, particularly in metropolitan Bangkok and its vicinity due to the excessive concentration of social and economic activities therein, has been brought about by increased urbanization and industrialization. Similar problems have begun to be observed in other cities in the country.

Problem areas in environmental management in Thailand that have been officially recognised are: natural resource management (forestry, soil, land use, water, minerals, marine resources, and mangrove forests), environmental pollution control (water, air, noise, vibration, solid waste and toxic substances), population distribution, and promotion of environmental awareness as well as environmental education and training. Cognizant of the adverse impacts of the deterioration of environmental quality on socio-economic conditions, Thailand, as can be inferred from its basic environmental policies and these targeted problem areas, has placed considerable importance on research and training. Considering the country's industrial boom which is expected to continue in the foreseeable future, research and training activities on industrial pollution control will necessarily receive increasing attention.

**Urban issues**

**Water pollution**

The causes of water pollution in Thailand are divided into four categories, namely, industrial effluent, mine effluent, domestic discharge and agricultural runoff. Industrial effluents are overall the prime source of water pollution, taking into account growth of different types of industries, their generative capacity, efficiency of waste treatment, and supervision. Past attempts at control and alleviation of water pollution problems have been handicapped by lack of appropriate investment in the construction of comprehensive waste treatment plants to serve large communities such as Bangkok metropolitan, regional urban centers, and other new urban communities.

**Air and noise pollution**

The sources of the largest amounts air pollution are industrial plants, such as cement plants, tobacco curing factories, and plants using lignite for electricity generation. Air quality and noise level from vehicles in Bangkok metropolitan and other major cities with heavy traffic are generally within acceptable standards except volumes of dust particles in some congested area.

**Pollution from solid wastes**

Garbage collection in the Bangkok Metropolitan Area (BMA) and other major cities is generally still deficient, resulting in problems of uncollected solid waste. As well, inadequate classification and sorting of different types of garbage results in inefficient disposal. There is also a high incidence of illegal discharge of untreated water from households and other activities into the public sewerage system and water resources. Pollution problems from solid wastes generally involve hazardous industrial wastes and these will become more serious in the future. In 1991,
there were about 2 million tons of hazardous industrial wastes, and this is expected soon to increase to 3.5 million tons, of which 95.5% will be generated by the industrial sector, with the rest coming from communities and hospitals. It is estimated that 70% of all the hazardous wastes is generated within BMA and its vicinity.

Pollution problems from toxic and hazardous chemicals

Economic and social development in the past has resulted in great increases in the impact of hazardous chemicals used in agriculture, such as pesticides and insecticides, and in industry as part of the production process. At present, management of toxic and hazardous materials through the various stages of these materials' life cycles, including import, storage, transportation, utilization and disposal, is still not systematic.

Rural development and agriculture

Rural development in Thailand is unconditionally preceded by land clearing. The techniques by which land is cleared often result in the decline - if not the complete depletion - of the productive capacities of agricultural resources through deforestation, soil erosion and degradation, and the alteration of hydrological regimes governing the frequency and severity of floods and droughts. Damage is caused by the practice of shifting cultivation or swidden agriculture, a common method in cash cropping and plantation cultivation in Thailand. Swidden agriculture leads to a loss of valuable genetic materials, and encourages surface runoff leading to a loss of soil nutrients. Organic wastes from agro-industries, based on the processing of rubber, palm oil, sugar and other agricultural products, are routinely discharged into the water resources.

Forestry issues

The forested area of Thailand declined from 53% of the land area of the country in 1961 to 20% of the total land area in 1995. The current magnitude of soil erosion and the frequency and duration of droughts and floods are, in fact, warnings that the remaining forest area is perhaps already below the critical amount needed to sustain ecological equilibrium.

Coastal zone and marine pollution

The coastal zone is the critical interface between the land, sea and the atmosphere. This delicate zone is subject to problems of silting and coastal erosion, industrial effluents, human waste disposal and oil pollution. Sedimentation is the major type of pollution in this respect. Rapid development results in soil erosion.

Sewage discharge is also a major polluting threat. The tourist trade and the siting of international hotels without proper sewage facilities within the coastal zones are sources of pollution.

Sedimentation from eroded soil due to forest clearing and logging has damaged the estuarine system in the Gulf of Thailand. Moreover, 30% of all mangrove forest area has been destroyed by developments such as salt production, mining, exploitation for wood, urban expansion and the establishment of industries.
Development of environmental consciousness

Thailand's development plan, prepared by the National Economic and Social Development Board (especially the Second Plan covering 1967-1971), stated that the basic objective of projects was to accelerate improvement in the living standards of the people, but it made no specific reference to environmental aspects per se. The Fourth Plan (1977-1981), published a year after the National Environment Board (NEB) was established in October 1975, signalled a major change of viewpoint. This Plan paid attention to the need for environmental protection by including it as a specific category in the development and conservation of critical economic resources and environment. Thus the Fourth Plan was Thailand's first to recognize the importance of environmental protection as a separate governmental field of endeavour.

In the Seventh Plan (1991-1996), Thailand recognized the importance of human resource development and the quality of environment by promoting the contribution of relevant scientific and professional institutions, as well as assessment and exchanges of environmental knowledge.
ENVIRONMENTAL PROBLEMS AND SOLUTIONS IN LAO PDR

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Lao PDR

General Overview

Lao PDR has an area of 236,800 km² and a population of 4.5 million (1994). In 1986, Lao PDR adopted the New Economic Mechanism, an economic reform package aimed at transforming economic activities from a central command system to a market-based approach, decentralising economic decision making, and allowing the private sector to take an active role. Since 1988, the annual average growth of the private sector has been 7.5%, while industrial growth is about 9% p.a. and agricultural and service sectors are growing at 7% p.a. In 1994, the per capita average annual income was $US325.

At present, the national economy remains heavily dependent on the country’s natural resource base. Forest currently occupies about 49% of the country’s area (11.2 million ha). In 1991, forestry resources provided about 55% of the foreign exchange earnings to the government and about 15% of the GDP. Water resources, which are currently exploited to only 2% of their total potential, provided about 13% of the foreign exchange earnings in 1992 and about 1% of the GDP. In 1989, it was estimated that arable land occupies 2 - 2.3 million ha or around 8 - 9% of the country’s land area; only half of this is currently under cultivation. The country’s mineral resources remain largely unexploited and could constitute one of the major sources of future economic growth.

Environmental issues

The major environmental problem in Lao PDR is the rapid degradation of forest resources. Between 1982 and 1989, deforestation was estimated at 470,000 ha. Nearly 60% of this (300,000 ha) is due to slash and burn cultivation by 170,000 cultivator families, with the remainder due to improper logging. The destruction of forest areas results in diminished wildlife habitats. Wildlife hunting for food and commercial sale is also the cause of declining wildlife in Lao PDR. Many species are endangered.

Due to the modest size of the industrial sector, environmental concerns in industry are still minor. Further environmental concerns that will need to be addressed in the future are related to hydropower development, mining and road construction.

Other emerging concerns are related to urban development. Existing water supply systems in different towns are generally in poor condition. Ground water contamination is slowly becoming a serious problem in Vientiane and other cities, both from sewage and increasingly from industrial wastes.
Environmental Solutions

Two types of interventions are proceeding simultaneously to address the natural resource management problems:

1. The formulation of a broad environmental policy framework, encompassing institutional structures, environmental regulations, and environmental assessment processes and procedures; and
2. Regulation of sectoral activities in forestry, protected areas development, agriculture, water, and so on.

All the main environmental problems are related to poverty. Providing employment and regular income for the population and income for the government are the highest priority. As a result, seven national development programs have been established. The easiest option is based on exploitation of natural resources, in particular, forests and hydro-power potential. The environmental concerns are important but the alternative costs in foregoing these resources could be much larger than costs of using them. Consequently, the government has to address the environmental problems by remedying the existing problems and preventing those from future development projects.

In the past, there was no institution involved with the overall environmental management in the Lao PDR, each ministry managing environmental issues among its sectoral tasks. After the 1992 Earth Summit in Rio, the Science, Technology and Environment Organisation (STENO) was established under the Prime Minister’s office. Its task is the coordination and ultimate responsibility for the overall management of environmental affairs of the country. It is mandated:
- to develop a national environmental policy framework;
- to develop a set of environmental planning and management tools and a regulatory framework; and
- to establish and operate a system of compliance monitoring programs.

It is also responsible for the co-ordination of environmental strategies of technical ministries and for resolving disputes concerning environmental impacts and competing resource use management. An inter-ministerial working group (IMWG), created and controlled by STENO, aims to provide consultancy and recommendations on environmental and resource use problems. The IMWG has members from relevant line agencies and is headed by the vice-president of STENO. Major decisions of environmental consequence, such as the construction of new hydro-power facilities, are to be discussed with IMWG.

Due to the cross-sectoral nature of environmental affairs, various ministries and agencies are involved. With the transformation from a centrally planned to a market oriented economy, the Lao PDR is also in the process of developing a new legal system. The Lao constitution was adopted in 1991. It states that “All organisations, citizens must protect environment and natural resources; land, subterranean, forests, fauna, water source and atmosphere...”. Legal reforms are being addressed in perceived priority areas such as investment, trade, and, more recently, in natural resources management.
THE STATE OF THE ENVIRONMENT IN CAMBODIA

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Introduction

On behalf of the Ministry of the Environment of Cambodia, I am grateful for the great honor to have been invited to participate in the Regional Seminar on Environmental Education, in which all participants have had the opportunity to exchange ideas, experiences and new technical information for environmental education in their own countries, so as to work towards regional and global strategies to achieve the goal of environmental protection and sustainable development. I believe that working together through discussion and exchanging knowledge and experience in this regional seminar is very effective and of great importance in addressing global environment problems. At this time, I would like to share some information on environmental issues in Cambodia with all honorable participants from countries in Mekong Basin. In my paper in Part II, I present some efforts in environmental education in Cambodia.

Environmental overview

Cambodia is an agriculture economy in which 80% of the labor force is engaged in agriculture and its related subsectors (fisheries and forestry). The population was estimated to be about 9.4 million in 1995 with an annual growth rate of 2.8%. The population density is about 52 persons/km² and 12% of the total people live in the cities.

Agriculture

Cambodia is an agricultural economy with the agricultural sector contributing about half of the country’s Gross Domestic Product (GDP). There are two main types of farming system:

- Rice based farming system, and
- Multi-cropping farming system.

Almost all areas used for rice-based production are located in floodplains surrounding the Tonle Sap Lake and the Mekong and Bassac Rivers. The multi-cropping system is practised along the Mekong river banks and in the upland brown and red soil areas. Agricultural output is significantly influenced from season to season by the weather, particularly by the impact of droughts and floods.

Fertilizer use in Cambodia has been very low compared to other countries in the region. Cambodian farmers used 40,000 tons per year, compared to Thailand’s annual usage of 1,000,000 tons, and 500,000 tons pa in Vietnam. However, unwise use of fertilizers may result in financial loss, crop damage and environmental problems.

The low agricultural productivity in Cambodia results from the following factors:

- Lack of irrigation
- Inadequate use of fertilizer
- Lack of pest and disease control
- Inappropriate land use policy
- Lack of skilled farmers.
Concerning the sustainable production and environmental protection, the Ministry of Agriculture, Forestry and Fishery is currently working in collaboration with the FAO, IDRC, and IRRI to launch a National Integrated Management Program which is being proposed to enable farmers to deal with pest problems. The IRRI, based in Phnom Penh, is also conducting research on improving rice production in Cambodia.

**Wetlands**

In Cambodia, the most important wetlands are the Mekong River and its floodplain, the Great Lake and the Tonle Sap River floodplain, marshes and grasslands around the Stung Sen, and coastal wetlands. Cambodian wetlands provide nutrient-rich, spawning habitats for fish. All types of Cambodia wetlands are used for gathering fuelwood and the production of charcoal. Fish, waterfowl, edible vegetation, and animals are directly used as a source of food. Aquaculture and agriculture are both supported by water from the wetlands.

Threats to Cambodian wetlands are numerous and vary with wetland type and location. They are summarized below.

**Mekong River and its floodplain**

- Water pollution by agricultural run-off carrying pesticide, fertilizers and domestic waste, and
- High pressure on the natural resources, forest clearing for firewood and charcoal.
- Threat in the near future include poor planning and management of development projects (irrigation and hydro-electric dams) and the growth of industrial activity.

**The Great Lake (Tonle Sap) and the floodplain of the Tonle Sap River**

- Illegal clearing of flooded forest for charcoal and firewood;
- Construction of fish traps;
- Transformation of wetlands to agricultural land;
- Over-exploitation and the use of destructive fishing gears;
- Increase in siltation as a result of deforestation in watersheds - it is estimated that the rate of sedimentation in the Great Lake is 4 cm per year.
- Water pollution due to domestic waste, mining and agricultural run-off.

**The coastal wetlands system**

- Clearing mangrove forests for firewood collection, charcoal production and for the development of intensive shrimp farming.

**Water resources**

Water resources are vitally important to Cambodia. Obviously, the Mekong River system, comprising the Tonle Sap Lake and 20 significant tributaries, plays a major role in the national economic development and subsistence of the people. Cambodia has a considerable water resource potential with abundant surface water and a high level of seasonal rainfall. However, this potential has not yet been developed for agricultural, industrial or household use.
The Ministry of Environment has paid particular attention to a report on the annual sedimentation of about 4 cm in the Tonle Sap Lake, and on the loss of biodiversity. The shortage of safe drinking water is one of Cambodia's most serious environmental problems. The water quality of the Mekong River is a regional issue and Cambodia is highly dependent on the policies and management of upstream countries. Deterioration of surface and ground water quality in Cambodia is mostly linked with the urban area, where untreated waste water from domestic use and industries is discharged directly into rivers.

Cambodia does not yet have a national water management policy addressing the multi-sectoral interest of water use. A comprehensive water management policy is needed which will rationalize water use in the areas of agriculture, fisheries, domestic use, hydro-power, transportation and tourism.

Forestry

Forestry is central to the livelihood of the Cambodian people and is Cambodia's main natural resource. Forest cover plays an important role in protecting Cambodia's various ecological types (watersheds and wetlands) and its biodiversity, and in supporting the economy. Nevertheless, Cambodian forests have undergone major changes in the recent past and serious concern has been expressed over their exploitation. Deforestation is being caused by uncontrolled logging activities and fires, increased demand for agricultural land, shifting cultivation, and fuelwood gathering for charcoal production and other domestic use. Forest cover declined from 73% of Cambodia's area in 1970 to 40% in the mid-1990s.

Forestry is vital for environmental stability. Deforestation in the mountainous watersheds leads to serious erosion, flooding and siltation of river beds. Floods in July 1994 caused an estimated USD200 million in damage to roads, reservoir and irrigation structures in central Cambodia.

Fisheries

Fish is the main source of the protein in the Cambodia diet. The fishery sector plays a significant role in the economy representing up to 50% of GDP.

Fish productivity is very closely linked to the hydrological regime of the Mekong River system and Tonle Sap Lake. Moreover, the wetlands and flooded forest around Tonle Sap Lake and along the Mekong River serve as breeding and feeding grounds for fish reproduction. The Great Lake Tonle Sap Lake was once one of the richest inland fishing lakes in the world, but it is now believed to be under ecological threat. Reports by fishermen and the Department of Fishery indicate declining numbers of larger fish in the catch. Cambodia fisheries are threatened by lack of good management policy, overfishing, environmental degradation, and the use of destructive fishing techniques such as explosives.

Industry

Energy

Energy resources in Cambodia consist of fuelwood and other biomass products, draft animals, imported petroleum products, and hydro-electric power. UNDP has estimated that wood contributes about 90% of the total energy supply and is the main source of energy for cooking. This practice of generating energy poses a serious threat to Cambodia's forest cover.

Energy demand in Cambodia can be expected to increase dramatically as the economy grows. There are some alternatives to meet this demand and development of hydro-electric dams should be seen as a
possibility in this regard in the near future. The Mekong River and its tributaries are potential sites for the construction of hydro-electric dams. In Cambodia ten dam projects have been proposed, of which Stung Treng and Sambor are on the mainstream of Mekong River.

These two plus a third one in Tonle Sap Lake are of great concern among environmentalists because of their unpredictable impacts on water regimes and the specific environments of the Mekong River and Tonle Sap Lake. Socio-economic conditions could be seriously affected by ecological changes associated with these dams.

**Mining**

Most mining operations are related to building material production and their impacts on the environment are still minimal. Nevertheless, the increasing siltation of the Stung Sengke River in Battambang Province, resulting from gem stone quarrying operations in upland Pailin, is an environmental concern that is causing water pollution and increased flooding adjacent to the river.

**Tourism**

Cambodia is richly endowed with both natural and cultural tourist attractions. Near Siem Reap is the outstanding World Heritage Site of Angkor. In other provinces, including in its coastal region, Cambodia has a diversity of scenic and natural areas. The upheavals of the last two decades have set back the economic and social development of tourism, compared to other country in the region. Revenues from tourism are expected to be a major, if not the largest, potential source for foreign exchange for Cambodia in the future. If properly planned and managed, the income from tourism can be equitably distributed to the population and utilized to meet other development needs.

Key issues related to the growth of the tourism sector include:

- Increases in tourism will cause changes in the natural and cultural environments.
- The 18 coastal resort facilities functioning in the last sixties and early seventies have been mostly destroyed and have not yet been redeveloped.
- There are no reliable tourism statistics for Cambodia prior to 1994.
- Few of the potential tourism resources and opportunities have been exploited.
- There is a lack of experience and well-trained technical personnel for the sustainable development of tourism resources.

**Management of toxic and hazardous waste**

Toxic wastes are by-products of manufacturing or other industrial processes which are released into the environment, and are considered poisonous to human and plant or animal life. Hazardous wastes are substances which because of their quantity, concentration or physical, chemical, or infectious characteristics, can be dangerous or hazardous to public health when improperly managed. Both toxic and hazardous wastes require carefully developed and specialized control mechanisms because of the environmental danger they pose if released untreated into the air, water or soil.

Cambodia has no specialized treatment or disposal sites yet developed for toxic or hazardous wastes. There are no rules or criteria for generation of toxic wastes, transporting and otherwise handling these wastes. Furthermore, waste load sources and amounts have not yet even been inventoried quantitatively. However, sources of toxic wastes can be expected to include the following:
- acid and heavy metals from vehicle batteries,
- vehicle crankcase oil,
- diesel fuel and gasoline,
- pesticides and pesticides containers,
- solvents and other metal cleaner.

Disposal may be releasing these types of wastes to an extent that undocumented environmental damage is occurring to air, water, and soil resources. Toxic waste cause groundwater contamination, posing risks to the users of the contaminated ground water supplies. Extraction and treatment of the wastes are technically difficult and always expensive.

Air quality and noise prevention

There are relatively few stationary sources (power plants and factories) or mobile sources (cars and buses) causing air pollution in Cambodia. Currently the main cause of air pollution is dust from (unpaved) urban roads and diesel generator exhaust. Other sources of air pollution include emission of volatile organic carbon such as benzene, toluene, and vinyl chloride from badly built fuel stations.

Most industries are using old equipment and operating without any environmental controls. Industries and cottage industries emit gases such as nitric oxide (NO), nitrogen dioxide (NO₂) carbon monoxide (CO), carbon dioxide (CO₂), and ozone (O₃) from fossil fuel combustion. Toxic chemical gases (H₂, S₂D₂, etc.) are also emitted by tyre production and paint production factories.

The Ministry of Environment has plans to institute the following: monitoring air quality; urban zoning (taking account of dominant wind patterns and other important factors) for future plans and industrial developments, research, design, and installation of pollution reduction technologies; and development of environmental educational programs.

The main sources of noise pollution are engine noises from generators and motorcycles. Engine noise is of particular concern where generators are located in close proximity to private residences. Inadequate housing for the generators and lack of noise mufflers have made this a major source of noise pollution.

To date there are no laws or regulations on Cambodia regarding air pollution control or noise prevention and no measurement of the level of these pollutants. The Ministry of Environment is in the process of drafting an environmental law which includes air and noise pollution. Standards need to be enforced which will safeguard human health and the environment. There are no Cambodian experts in air and noise pollution issues and no equipment to measure and monitor air pollution. The Ministry therefore requires training and equipment in order to implement pollution programs.

Policy and strategy for environmental management

Cambodia's Constitution mandated the Ministry of Environment to supervise, protect, preserve, and conserve natural resources, to prevent all kind of environmental pollution, and to implement environmental law or policy.

The Ministry currently employs 620 staff assigned to 1 Bureau and 6 Departments including:

- Bureau of Administration and Finance.
- Environmental Planning, Water and Land use management;
MEKONG ENVIRONMENTAL ISSUES AND EDUCATION

- Nature Conservation and Protection;
- Pollution Control, Reduction, and Prevention;
- Legal Affairs;
- Education and Communication

The environmental staff are still short of experience and knowledge on environmental issues. However, the Ministry has recognized its priorities and has formulated its activities as follows:

- passage of overall Environmental Legislation which defines authority and responsibilities;
- preparation and passage of an EIA Law;
- cooperation in land use planning and zoning;
- preparation of management plans for national parks and other protected area;
- drafting of regulations, guidelines, and standards for environment and pollution control;
- integration of environmental policies into the socio-economic development and decision making;
- sustainable development;
- environmental education and awareness;
- public participation; and
- biodiversity conservation.

Environmental legislation

With support from UNDP, UNEP, USAID, and IRDC, the Ministry of Environment has finished drafting the Environment Law and submitted it to the Council of Ministers for approval. The Law will then be ratified by the National Assembly for final passage.

The Law consists of 9 Chapters that contain 37 Articles. The Law places responsibility for national and regional environmental action planning, Environmental Impact Assessment, natural resource management, pollution control, monitoring/inspections, and public participation in the Ministry of Environment with cooperation with other involved Ministries, organizations, and other entities.

In addition to Legislation that authorizes and defines the Ministry of Environment's activities in general, additional administrative measures need to be adopted in the form of sub-decrees, regulations, criteria and standards in order to promote comprehensive implementation of the environmental policies and strategies.

Constraints to intervention in priority problem areas

The major constraints that still exist are noted as follows:

- lack of human resources, materials, and financial resources to manage and protect the environment;
- lack of integrated environmental information system for data analysis;
- border problems and corruption which limit capacity for enforcement of resource laws;
- lack of pollution control standards;
- additional enabling legislation and regulations are needed by the Ministry of Environment and other resource-oriented agencies to empower appropriate governmental environment management and control activities;
- lack of security in some places, especially in areas remote from cities;
- land mines problems.
Conclusion

The Kingdom of Cambodia is on the threshold of significant progress in environmental management and sustainable development. Cambodia’s natural resources can provide stable economic conditions to the local people nationwide if properly managed. However, Cambodia has already experienced environmental consequences of drought and flood, soil degradation caused by deforestation, inadequate agricultural practices and other illegal activities.

Understanding the seriousness of these problems, the Government of Cambodia and all its agencies, including the Ministry of Environment, are positively working out action plans and strategies towards environmental enhancement and protection. We accept the idea of sustainable development as a strategic goal of our economy, while maintaining environmental quality. It is difficult for Cambodia to successfully pursue this goal, but there is confidence that the overall direction of attempts in this regard is correct.

To overcome all constraints to environment intervention, Cambodia still needs to invest time, efforts, funds, and technologies through collaboration with, and assistance from the world community and international agencies. Cambodia is already indebted to and grateful to ADB, World Bank, UNDP/ETAP, UNEP, IDRC, IUCN, UNESCO, USAID, and other international organisations for their ongoing assistance in all activities related to environmental protection in Cambodia.
MAJOR ENVIRONMENTAL ISSUES IN MYANMAR

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Issues

In contrast to many other countries in the region, Myanmar has experienced fewer environmental degradation and pollution problems. However, the country faces some environmental issues arising from underdevelopment and poverty.

Firstly, there is a problem of deforestation. In Myanmar, more than 90% of renewable energy consumption depends upon forest resources. Few homes in Myanmar have supplies of gas or electricity. Thus, there is a heavy reliance on fuelwood resulting in depletion of forest cover. During the 14 year period from 1975 to 1989, the total forest cover declined at an annual rate of 15,100 ha. The depletion of mangrove forests in the Ayeyarwady delta has been particularly severe, and is mainly caused by excess exploitation of the mangroves for fuelwood and charcoal production. Deforestation also results from shifting cultivation which is practised by about 2.6 million people mostly living in the hilly areas covering about 142,000 ha.

Secondly, there is a problem concerning loss of biological resources. Wildlife in Myanmar is currently being threatened and endangered as a result of habitat loss, hunting and poaching. It is estimated that there are 34 endangered species including 11 reptiles, 4 birds and 19 mammal species.

Thirdly, there is a problem of pollution. However, the extent of industrial pollution and accompanying environmental degradation is highly localised. The degree of air and water pollution caused by industry or agriculture has been minimal due to the low level of industrialization and relatively small amount of chemicals used in agriculture. Data on sources of inland water pollution as well as data on air pollution and air quality are not available. There are no air pollution and air quality monitoring stations or automobile exhaust monitoring stations in Myanmar. However, pollution from vehicles is also not significant and to the present time Myanmar has not encountered serious problems concerning marine pollution. Indoor air pollution due to fuelwood and charcoal combustion may exist but the danger has not been fully recognized. Surface waters to which people have access are sometimes found to be contaminated with faecal matter. Hand-dug wells can also be contaminated by waste matter mainly due to unprotected well heads and lack of drainage. Ground water can also be affected by solid and liquid waste dumped onto the ground surface.

Fourthly, land degradation through wind and water erosion is also found to have occurred in areas where deforestation has taken place. Soil erosion is especially found in the barren plains where the top soil is blown away by wind. Water erosion also occurs along the slopes of denuded hills when the top soil is eroded by heavy rains. The arid zone in Central Myanmar is especially prone to wind erosion. The central dry zone areas have relatively fewer trees and less vegetation due to low rainfall. The situation has been aggravated by indiscriminate felling of trees for fuelwood.

With regard to natural disasters, the occurrence of earthquakes, landslides and famine due to droughts are negligible in Myanmar. Though there are cyclones and floods during the monsoon months, their occurrence is also not frequent.
Remedial measures

Environmental awareness campaign

The Promotion of environmental awareness is one of the main areas of concentration of the current activities of the NCEA. The Committee on Research, Education and Information and the NCEA Staff Bureau in co-operation with other government ministries, particularly the Ministries of Information, Education and Forestry, have been promoting environmental awareness through the mass media. World Environment Day is also celebrated on a nation-wide scale to draw public attention to environmental matters.

Afforestation campaign

Sustainable production of forest resources and conservation of biodiversity are assured by a Forest Working Plan which is revised every ten years. This is complemented by an afforestation programme whereby 36,000 ha are planted annually.

These annual plantation programmes have also been reinforced by a nation-wide afforestation campaign with full public participation. These efforts have been redoubled since the UNCED held in Rio de Janeiro. In 1992 a high level Central Body for country-wide planting of fast-growing trees was formed to coordinate this task. These fast growing trees are planted for fuelwood and it is expected that they will provide the energy needs of the rural population and slow down the rate of deforestation. Since 1992, about 11 million fast-growing trees were planted across the country every year with public participation. In 1994 the Ministry of Forestry conducted a project, "Greening and Fuelwood Plantation scheme for the Nine Critical Districts of Arid zone of Central Myanmar"; this is a national ongoing project.

Poverty alleviation

Aware of the fact that poverty is the fundamental cause of environmental degradation, the Government is exerting efforts to eliminate poverty by embarking on an ambitious multi-faceted programme for the development of the border areas which are mostly inhabited by ethnic minorities that have traditionally lagged behind in all aspects of development owing to difficult terrain and poor communications. Due to their poverty and lack of knowledge in modern agriculture, their dependence on forest products, shifting cultivation and illegal poppy plantation has posed a significant threat to the environment.

The programme is expected to generate higher incomes and productivity by providing income-earning opportunities and increased welfare for the inhabitants in the areas. The Government's support for the development of mini-hydro-power plants and water resources will provide alternative sources of energy for the local people lessening their dependence on fuelwood. By providing a whole range of economic and social services, the Government not only aims at alleviating poverty but also hopes that the introduction of modern agricultural practices will do away with the environmentally unsound method of slash-and-burn agriculture. This rural area development programme would not only have positive effects on the socio-economic environment, but also reduce the area under shifting cultivation, resulting in conservation and regeneration of forest resources in the fragile mountain ecosystem. A separate ministry was set up in 1992 to promote all round development in the border areas.
Part II

The educational response to the environmental situation: the Mekong region and Australian experiences
Like many other low-income, developing countries, Vietnam is now facing critical issues of the degradation of its natural resources and a decrease in environmental quality. Major environmental issues include deforestation, degradation of land resources, inefficiencies in the conservation and use of water resources, degradation of biological resources, wastage of mineral resources, environmental pollution and long term environmental impacts of war. On the one hand, the ongoing transition from a centrally planned economy into a market oriented economy, and the rapid industrialization and modernization processes are accelerating the socio-economic development of the country and improving the living conditions of the people; on the other hand, however, these changes are creating new complex issues of environmental degradation.

In addition to the above-mentioned environmental issues, Vietnam’s labour force and natural resources, and its relatively loose environmental controls, are attractive to many foreign companies that lack resources and are subject to stricter controls over the environment and the exploitation of natural resources in their own countries.

Since the early 1990s, environmental pollution in urban, industrial areas and also pollution of rural, agricultural regions have been increasing. Pressure on land, water, energy and other natural resources becomes more serious. Urbanization and unorganized population migration has been occurring in many cities and provinces. For the solution of these issues and promotion of sustainable development of the country various environmental protection instruments have been used, among these environmental education.

Environmental Education (EE) policy

EE in Vietnam is carried out mostly in 2 sectors: the national education system, supervised by the Ministry of Education and Training (MOET), and the environmental protection sector, under the supervision of the Ministry of Science, Technology and Environment (MOSTE).
The Environmental Protection Sector in Vietnam is under the supervision and management of the Ministry of Science, Technology and Environment (MOSTE), which has among other tasks that of training of environmental officers and promotion of people environmental awareness.


"Development of an integrated environmental and sustainable development curriculum. This curriculum should specifically focus attention on the basic concepts of sustainable development. It should also establish the need for specialized degree courses in the field of environmental sciences within a framework for sustainable development and the training of teachers in this field. Both men and women should have equal access to all training programmes.

Development of curricula, syllabus and textbooks should be given high priority for the introduction of environmental education at all levels and the establishment of specialized degree courses in the field of environmental sciences."

The National Plan lists the various components of EE as:

- Formal EE, including: the development of curricula, syllabi and textbooks for all levels of the national education system, postgraduate courses on environmental science and technology and training of teachers.

- Technical Training, including: specialized training, overseas training and fellowships, and international exchange of expertise.

The specialized training of environmental experts, including engineers, technicians, scientists, and managers is considered as belonging to the category of "environmental training".

Following the National Plan for Environment and Sustainable Development issued in 1991, and in 1995 in co-operation with the International Development Research Center (IDRC), MOSTE has prepared a Vietnam National Environmental Action Plan. The final draft of this document indicates the necessity to develop an "Environmental Education Programme for Primary, Secondary and Vocational schools". This is seen as one activity in the Program entitled: "Increase Public and Professional Awareness of Environmental Requirements".

The Law on Environmental Protection, issued by the President of the SRV on January 1994, states in its article 37, point 8, that:

"The scope of state management of environmental protection includes:

Training of experts in environmental scientists and managers, carrying out of education, propaganda, dissemination of knowledge, laws and regulations on environmental protection."

Environmental Education activities

From the above-mentioned policies, it is clear that the Government and related authorities of Vietnam are aware of the importance and urgent need for development of EE in the country. Starting from these policies, during the last decades many efforts have been deployed for the development of
EE, training and promotion of EE throughout all levels of the education system. Participation of students in practical environmental protection activities has been organized at various institutions in different localities.

Organized activities aiming at the development of EE in Vietnam started at the beginning of the 1980s. The first work in this field was a research project on introduction of EE to Vietnamese schools system carried out since 1981 by a team of researchers from Hanoi University, Hanoi Teacher Training (College of Pedagogy) and the National Institute for Educational Sciences within the framework of the National Research Programme on Environment, funded by MOSTE. During the 1980s and early 1990s, EE research activities included: elaboration of curricula, textbook writing, trial teaching and training of teachers.

In 1991 the Vietnam National Plan for Environment and Sustainable Development evaluated the development of formal EE as:

"Various aspects of the basic environmental sciences are already incorporated in the traditional educational curricula in the schools and colleges".

Based on the results obtained from these research and extension activities in the late 80s and early 90s, EE has been partly introduced to the schools system by MOET, as follows:

- **At Preschool Level**: In the programmes for the 3 grades of preschool level officially approved and issued by MOET, the section on orientation for learning activities includes a paragraph on “Familiarization With Surrounding Environment”, including contact with social and natural environment.

- **At Primary Education Level**: In the programmes for the 5 grades of primary education officially approved and issued by MOET, EE is combined with the teaching of 3 subjects: “Nature and Society”, “Health Education” and “Moral Education”.

An experiment on development of EE at primary education grades has been carried out since 1990 by the Center for Educational Technology. In this experiment, a subject entitled “Living Environment” is created for all of the five primary grades. Textbooks for the subject were edited and used in experimental classes. In these classes, EE is also carried out during the teaching of other subjects, such as “Study of Nature” and “Hygiene”.

Since 1986, Haiphong City’s Department of Education and Training has elaborated and implemented a subject on “Traffic Regulations and Urban Environment” for primary schools in the city. In 1993 the subject has been upgraded to “Population, Resources and Environment”. A guideline for this subject teaching was published in a large format edition.

- **At Lower Secondary Level**: In the teaching programme for lower secondary schools approved and issued by MOET, EE is combined with the teaching of “Biology”, “Geography” and “Civic Education”. For Grade 8, he Biology textbook includes a section entitled “Environment and Living Organisms Distribution”.

- **At Upper Secondary Level**: In the teaching programme for upper secondary schools approved and issued by MOET, EE is combined with the teaching of “Biology”, “Geography”, “Civic Education”. In the Biology textbook there are two chapters on Ecology and a chapter on “Biosphere and Man”.


At Higher Education Level: On 12 September 1995 the Minister of MOET issued Decision No 3244 GDDT on Provisionary Application of Curricula for the General Education Phase in Universities and Teacher Training Colleges. The curriculum of “Environment and Man”, coded 107 (MT) 105 is one among the approved curricula, which should be taught in three teaching units (45 hours of lecture). “Environment and Man” is a compulsory general subject for students in all branches of learning: natural sciences, humanities, social sciences, agriculture, industry technologies, economic and business management. More specialized knowledge in environmental sciences and technologies is taught in various undergraduate and graduate courses of biology, geography, economics and engineering of Hanoi University, Hochiminh City University, Hanoi University of Technology, the College of Civil Engineering, Colleges of Agriculture, Forestry, Geology and Mining and some other central or regional higher education institutions. Short term, medium term and long term postgraduate training courses for environmental managers and researchers have been carried out since 1988 at the Center for Natural Resources and Environmental Studies (CRES) of Hanoi University; at the Center for Water Treatment and Environmental Technologies (CEFINEA) of Hochiminh City University of Technology; Center of Environmental Sciences and Technology of Hanoi University of Technology; Center of Environment of Towns and Industrial Areas (since 1992), and more recently at some other university centers. The training of students specialized in environmental sciences at Bachelor degree started in 1992 in the Faculties of Biology and Geography of Hanoi University.

In Teacher Training Institutions: EE began in the late 1980s in Hanoi University of Pedagogy, Hanoi Junior Teacher Training Colleges, Ha Tay Province Junior Teacher Training College and some other institutions. EE became compulsory in teacher training universities and colleges by the decision of MOET No 3244 GDDT, on 12 September 1995, mentioned above.


In other types of educational institutions: Research and experimentation on the introduction of EE were also carried out in the period 1992-1995 in other types of educational institutions, including vocational training schools, secondary schools for technician training, educational and training institutions of the defence sector, and those of the political and people organizations. As a result of these research and experimentation activities, a curriculum for EE, entitled “Man and Environment” was proposed to MOET.

Organization of Participation Activities of Students in EE: Several schools have organized intensive participation of students in local environmental protection activities in parallel with “environmental studies”. During the 1991-1992 school year students and teachers have planted 13 million trees and reafforested 2,265 hectares of barren land. MOET estimates that a well-organized campaign of reafforestation and trees planting in the schools system could plant 40 million trees annually and reafforest 5,000 ha of barren land.

In Hochiminh City in 1994-1995, school students developed several activities to contribute to the city’s effort in the “Green and Clean” campaign. In Quang Ninh province students are organized for keeping the school environment clean and participating in cleaning the streets around schools. There are similar examples in many other provinces and cities. Vocational schools located in the midlands of the northern part of Vietnam actively participate in the huge
reafforestation campaign of the Government, coded “Programme 327”, beginning with the planting of trees in the schools campuses and then expanding to surrounding localities.

- **International Co-operation in Environmental Education:** So far, international co-operation activities in EE have consisted of:
  
  * participation of Vietnamese experts in regional and international conferences and workshops on EE;
  * participation since 1993 of the Center for Environmental Education of the Teacher Training College of Hanoi National University in the South and South East Asia Environmental Education Network (SASEANEE);
  * participation of the National Institute of Educational Sciences (NIES) in the project “Science and Environmental Protection in Asia and the Pacific” since 1995; and
  * implementation of international and foreign assistance projects on Environmental Training by various Vietnamese academic institutions.
  * The establishment of the UNESCO Chair of Environmental Education at CRES, Vietnam National University in Hanoi in 1995 could be considered as an important activity in the development of international cooperation in EE in Vietnam.

These efforts have established the base for further development of EE in the country. We can, however, note that along with positive results there are still many weaknesses in EE in Vietnam:

- A large part of efforts in EE is oriented to “Education About the Environment”, but not to “Education For the Environment”.
- Efforts for EE development are segmented in the education and training system, as well as in individual educational institutions. Efforts for the establishment of the teaching of a separate environmental subject are stronger than that for integration of EE into all disciplines at all levels.
- There are still no clear objectives for the ongoing development of EE in the coming years and no clear strategy for their implementation.
- There is no adequate national organization for the coordination of the interdisciplinary, multisectoral activities of EE, and the establishment of the necessary links between EE, environmental training and environmental awareness.
- There is a serious lack of information on progress and experience in international developments in EE, and only weak links with international and regional networks of EE.

**Recommendations for further development**

In order to evaluate the present situation and to propose to the relevant authorities appropriate measures for strengthening EE, MOET together with MOSTE convened the “National Conference on Environmental Education”, in Hanoi, from 26 to 27 September 1995. This conference was followed by the National Forum on Environmental Education and Training, also in Hanoi, from 27 to 29 December 1995.

The Conference and the Forum presented to MOET and MOSTE proposals on:

- **Strengthening the Understanding on the Need for Development of EE:** EE is becoming increasingly important as Vietnam enters a new period of industrialization and modernization, EE should be incorporated into everyday life and started from early childhood;
- **Curricula and Contents of EE:** EE should be included in the curricula of preschool, primary, secondary education; 5 to 10% of teaching time should be allocated to EE. Adequate integration
of EE with the teaching of other subjects should be defined and legalized by government decisions.

- **EE Teaching Methods and Forms**: Advanced methods of teaching, especially those facilitating active participation of students in the teaching-learning process, should be used in EE; MOET should provide the necessary conditions and support for the development of these methods.

- **Teacher Training in EE**: Training of teachers in EE should be developed in teacher training schools and colleges, including coverage of the contents and methods of EE.

- **Strengthening the Training of Environmental Experts**: Elaboration of Training Policy and Planning including short, medium and long-term training at national as well as at provincial level, coordination of activities at various training institutions; determination of curricula and elaboration of relevant teaching materials in environmental sciences and technology at universities and colleges.

- **Material Technical Base for EE**: Conditions for EE development such as school gardens, the school water supply, and sanitary facilities should be developed.

The proposal has also underlined the need for:

- **Elaboration of EE Policy**: Co-operation between MOET and MOSTE for EE policy elaboration, promotion of environmental awareness in all community members, organization of EE associations in schools, application of experience of population education into EE.

- **Integration of EE activities**: Activities of teachers and of students, and of various types of educational institutions; integration of EE with the teaching of various subjects; choice of appropriate and EE effective methods.

- **Coordination of activities related to EE**: Combination of in-school and out-of-school activities; cooperation with various ministries and people’s organizations in EE development.

- **Teacher Training for EE**: Promotion of EE during preservice, as well as during in-service training.

The proposal suggests the oriented priorities of environmental education and training in Vietnam from 1996 to 2000, as follows:

- **EE and training for the community**
- **Training of environmental teachers and lecturers**
- **EE in primary and secondary schools; training at undergraduate and graduate levels**
- **Training on environmental monitoring.**

The principal content for these oriented priorities are as follows.

**EE and training for the community**

* Training of policy makers and decision makers at every administrative level: national, provincial, and district.
* Training of environmental managers at every administrative level.
* Training of State and private businesses.
* Informal education and training through public communication, workshops, conferences, exhibitions, and so on.

**Training of teachers on EE**

* Short-term training with separate subjects.
* Training at graduate and Master’s level.
EE in schools

This is a large task as there are 54 ethnic groups with more 13 million teenage children attending school in Vietnam.

* Developing a curriculum and estimating the amount of knowledge needed to integrate with subjects at every level.
* Training of teachers on the methodology of transferring the knowledge of environmental interactions to pupils

EE and training at the undergraduate and graduate levels

* Integrated training on natural science, social science, humanities, economics, and sociology at undergraduate level.
* Training on environmental science in a specialized faculty at the undergraduate level.
* Training on environmental science in a specialized discipline at the graduate and Master's levels.

Training on environmental monitoring

Training and continuing re-training in this field aimed to serve the task of the environmental protection of Vietnam.

Conclusion

We believe that the issuing by the Government of a national policy and related strategies and longterm plan for the development of EE based on the above mentioned proposals will create better conditions for the task of environmental protection and sustainable development in Vietnam.
THAI TERTIARY LEVEL ENVIRONMENTAL EDUCATION, TRAINING AND RESEARCH: ROLES AND PROSPECTS OF THE ENVIRONMENTAL RESEARCH AND TRAINING CENTRE

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Introduction

The earlier paper by Monthip summarised the major environmental issues in Thailand. This paper assesses the requirements for Thai educational and training institutions, such as the Environmental Research and Training Center, to meet the challenges that arise from the country's rapid transition from an agricultural economy to an industrial economy and its continued movement towards a post-industrial sustainable economy.

Teaching and training programmes

The teaching programmes and research activities related to the environment in Thailand are indeed impressive in their length, variety and scope. This is particularly significant since over recent years the country has been a developing nation with priorities of economic growth, rural development and the eradication of poverty. The introduction of environmentally related courses and programmes in Tertiary institutions began in the 1970s with the wave of environmental consciousness among governments, citizen groups and international organizations. There is still, however, a need for an active training programme for environmental management and impact studies.

Within ASEAN member countries, ASEP (ASEAN Environment Programme) was initiated. Deliberation at the ASEP meetings has emphasized the role of environmental education. The goals of ASEP I and ASEP II, which specifically relate to environment, are:

- Development of a network of institutes offering coordinated programmes on environmental training and education, including research on environmental subjects (ASEP I (1978-1982), Goal No.7).

- Promotion of environment education and training in the ASEAN region through the development of suitable national programmes at school, out-of-school and other levels; and a network of institutions of higher learning offering environmental education, training and research programmes (ASEP II (1983-1987), Goal No. 10).

Recently, the United Nation's Network for Tertiary Level Environmental Education and Training in Asia and the Pacific (NETTLAP) was formulated. The main tasks of NETTLAP are to develop curricula, human resources, teaching methods and materials, and academic cooperation and communication.

In Thailand, many universities have made significant attempts to broaden the methodology of their teaching to include interdisciplinary studies which lie at the base of the development of environmental education. Prior to this, the emphasis was on a monodisciplinary approach, mainly to train the scientists and humanists for the public and private sectors. Tertiary education was
viewed as fulfilling the immediate needs of the country in terms of staff resources for development and economic administration. However, the escalation of environmental consciousness at a global level, fears of rapid depletion in natural resources and the increase of environmental hazards to the quality of life have motivated the introduction of a variety of teaching programmes. Some are degree-awarding programmes, but many are designed as unit courses to form part of a degree programme. Some of these courses change frequently as a result of changes in teaching staff, reorganization of teaching programmes and formation of national priorities.

The role of environmental education and training has been justly acknowledged as the prime channel for safeguarding the quality of life of the citizens through sound environmental management. The problems initiated through human activities can only be solved through education, research and training. The purpose of environmental education is to raise awareness and understanding among the general populace, as well as that of development workers, and officials managing natural resources and habitats.

In Thailand, the Asian Institute of Technology (AIT), Chulalongkorn University, Mahidol University, Kasetsart University, Thammasat University, Chiang Mai University, Silpakorn University, Prince of Songkhla University, Kraek University and Khon Kaen University have introduced Bachelor degree, Master degree, and Ph.D. programmes in the field of environmental science, management and engineering.

The shortage of skilled/technical manpower in Thailand was initially met through foreign assistance, which was soon replaced by different environmental research institutes. These centres were initiated either by government through the agencies implementing national policies, or by concerned individuals trained in a specialized field of study related to the environment.

One such activity is the programme on research and training at the Environmental Research and Training Center (ERTC) at the Department of Environmental Quality Promotion (DEQP), Ministry of Science, Technology and Environment (MOSTE). The programme coordinates and integrates environmental research in universities, helps in policy formulation at community and national levels, and plans and assists new and appropriate environmental management programmes. It also trains people in environmental research and management, develops curricula on environmental science and management, and help heighten awareness among public officials, teachers and the general public.

Compulsory courses for all undergraduates - usually in the First Year - have been instituted in most universities. There is some difficulty in obtaining complete documentation of these course as they are often non-examinable and presented to hundreds of undergraduates, and the responsibility for implementing them is rotated between various faculties. However, these courses aim at exposing students to environmental issues and to creating an awareness toward environmental problems. In some universities these courses are compulsory for non-science candidates.

Programmes that possess a major component of environmental topics are understandably in the sciences, such as the biological sciences, marine sciences, ecology, agricultural programmes, and forestry. These programmes are interdisciplinary in character, so that environmental issues can automatically comprise a large and natural portion of the course content. Indeed, these issues often function as the foundations for these programmes.

A wide range of optional environmental courses is offered by almost all departments under various programmes in most universities in Thailand. The objective of this practice is to provide
an opportunity for students to sample a number of topics/areas of study in order to make them sensitive to the many problems and issues of the environment in the national and regional contexts. These optional courses contribute to the unit requirements of the programme overall, giving it credibility and academic status.

The organization most active at the operational level to support environmental education in formal school systems in the region is the UNESCO Principal Regional Office for Asia and the Pacific, in Bangkok. Activities such as workshops, curriculum development, teacher preparation materials, and seminars and conferences are scheduled regularly. These activities encourage and aid nations to adopt such programmes and foster inter-regional exchange of information and expertise.

Teaching programmes for pre-service preparation of teachers are well developed in all disciplines except in the area of environmental sciences. The teacher preparation institutions are established by the government and staffed by qualified academics engaged in teaching and research in the subjects currently taught in schools. Unfortunately, the environment as a subject does not exist separately in the secondary schools and thus, it is not clearly shown in the curriculum of secondary teacher training colleges. Environmental topics as a component of in-service training of teachers have, however, become compulsory.

To expose teachers to environmental concepts and issues in a formal manner is the aim of the short one-week course conducted by Environmental Research and Training Center (ERTC) and the Public Education and Extension Division at the Department of Environmental Quality Promotion (DEQP). The course comprises such topics as introduction to environmental policy and planning, environmental degradation, conservation and protection of the environment, environmental education, conservation of resources, land use, pollution control measures, urban rural environmental problems, tourism and the environment and environmental activities for schools. Of significance in environmental education are the teaching activities of volunteer citizen groups. The Public Education and Extension Division, DEQP, plays a leading role in disseminating information and providing training in basic skills and practical methods to improve the quality of life of the people and to help them encourage activities that promote environmental quality. These volunteer groups have been recognized by government as valuable and efficient channel of communication between policy-makers and people.

Roles and Prospects of the Environmental Research and Training Center (ERTC)

ERTC is operated by the Department of Environmental Quality Promotion, under the overall jurisdiction of MOSTE through the Japanese Project-Type Cooperation. The fundamental purpose of the ERTC is to carry out research and provide technical support for the implementation of environmental policy and environmental management initiatives. The Center provides vocational training to staff in national and local governments, and in non-governmental organizations, focusing on training professionals and technical staff in the necessary techniques for successful environmental management. In this way, ERTC fulfills a very different function from other existing institutions.

The objectives of the ERTC can be summarized as follows:

- To undertake practical research programmes on environmental management particularly in the field of water pollution, air pollution, noise and vibration, solid waste and toxic substance pollution.
• To promote and encourage research on environmental quality in cooperation with educational establishments and other agencies.

• To strengthen the monitoring programmes which study and analyze environmental conditions and quality for use
  i. in the planning and determination of the national environmental quality standards, and
  ii. in the formulation of guidelines for the enhancement of the national environmental quality.

• To provide training programmes on environmental management for government organizations, local government and other concerned organization.

• To promote environmental education for staff at all levels and to foster qualified instructors with appropriate technical expertise.

ERTC has developed training courses on 38 different aspects of environmental management and laboratory quality control. Through these courses, ERTC has a unique opportunity for teaching, training and research in areas where environmental problems are most evident. This programme was instituted in 1991 to promote and help resource management systems that are productive, ecologically stable and socially acceptable. ERTC was recognized at the recent meeting of Asia-Europe leaders to be the Asia - Europe Centre for Environmental Technology.

One of the principal goals of ERTC is to develop human resources, improve quality of life and enhance the quality of environmental and natural resources. It is envisaged that ERTC will not only cater for the needs of Thailand, but also will make a contribution to the neighbouring countries in the region.

**Environmental education network**

In order to assess the priorities and needs in environmental education in a way that is useful for educational decision-makers as a primary source of information for the formulation of national, regional and international action in environmental education, there is a great need to promote an environmental education network at the Tertiary level in Indochina.

A proposed programme for the network is as follows:

• To provide mechanisms for integrating, reinforcing and enhancing present and future teaching programmes and methods on environmental science and resource management, with the aim of generating further information required for the network.

• To relate with, and assist, existing institutions in the formulation of policies related to human resource development programmes at the local, national and regional levels that assure the implementation of the environmental education strategies.

• To relate with, and assist, existing institutions at the local, national and regional levels in the enhancement of curriculum development of all sectors of society through appropriate academic co-operation and communication.
CONCLUSION

Human resource development is a long-term endeavour requiring continuous efforts, inputs and funding. Education and training must be supported by research and, similarly, research activities must be complemented by education and training to ensure that knowledge and skills continue to develop. A network at the Tertiary level of environmental education, training and research is a key element for the formulation of national, regional and international action in environmental education.
ENVIRONMENTAL EDUCATION IN LAO PDR

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Introduction

Three types of environmental training are needed to enhance the institutional capacity and environmental awareness necessary to integrate environmental concerns into overall economic development. These are:

- Environmental assessment and monitoring;
- Environmental management training (mainly natural resource management); and
- Environmental education and awareness building.

Environmental assessment and monitoring

The government’s capacity to ensure the application of environmental assessment processes and the monitoring of adherence to environmental standards in the industrial and mining sectors will be strengthened by training in environmental assessment for the staff of the Science, Technology and Environment Organisation (STENO) and line agencies. This training will develop their capacities to manage the implementation of environmental assessment by developing STENO and line agency staff’s awareness of the purposes and goals of the environmental assessment system, as well as increasing their knowledge about the environmental assessment systems and skills in managing its application.

Over the longer term, environmental assessment training should focus on developing a cadre of Lao specialists with expertise in the implementation of environmental assessment. The assessments themselves, however, will still require considerable external support but local expertise and experience will be enhanced by maximising Lao involvement in all environmental assessments. Implementing agencies responsible for conducting environmental assessment should be encouraged to participate in these studies. The involvement of Lao specialists in these studies is explicitly designed as practical training experiences.

Environmental management training (mainly natural resource management)

In the light of Government priorities, and limited human and financial resources, environmental management training should focus on promoting environmentally sustainable natural resource management. An expanded program of formal environmental management training is not, however, justifiable in the short term. Existing programs such as those in forestry and conservation are already absorbing a considerable proportion of scarce human resources. Therefore, in the short and
medium terms, environmental training should mainly focus on the practical, especially on-the-job training for managers and technicians in agriculture, forestry and water resource sectors. On-the-job training should be supplemented by short training workshops focussed on priority environmental management problems in Lao PDR (eg, protection of potable water supplies, agro-forestry techniques, sustainable production forest management, conservation, monitoring, of emissions and effluent, and so on). Many short courses of this type are delivered within programs already in operation (eg, rural water supply and sanitation programs financed by UNICEF, SIDA/IUCN forest management and conservation courses, and IDA/FINNIDA/GEF forestry management and conservation projects).

In the long run, the national polytechnique institute will become an important local centre for future environmental management training of Lao engineers and technicians. In the short term, however, the institute is constrained by a lack of qualified staff willing to accept their very modest terms and conditions of service. As this situation improves, however, there should be scope for enhanced support for the institute to develop a suitable curriculum for environmental management training. A start could be made by involving interested staff and students in environmental impact assessments carried out by external expertise and by inviting them to specific short-term training courses in this area.

**Environmental education and awareness building**

Awareness building initiatives are beginning to develop at four levels:
1. community-based resource management and consultation;
2. introduction of environmental issues into the public school curriculum;
3. public awareness building programs using all avenues including mass organisations, and
4. integration of the environment into community, district, and provincial levels of planning and consultation mechanisms.

Community-based resource management, empowering local communities to manage adequately the natural resources which they have traditionally controlled and used, is one of the most effective ways to increase environmental awareness and subsequently achieve a more sustainable use for the country's natural resources. As indicated earlier, mass organisations and communities are required to play an important awareness building role and their role and contributions are 'factored' into technical assistance and environment programs.

Under the on-going reforms of the public primary and secondary school curricula, environmental education has become a significant component of public education. Curricula now developed and to be introduced progressively as part of the science curriculum include "The world around us", which focuses on the relationship between peoples, animals, plants and the natural word. An integrated secondary science curriculum (first cycle) includes a component on ecology. In addition to these curricula, school children are already trained in environmental health and sanitation. These kinds of public school programs can have significant positive impact on both present and future environmental management practices in the country.

Support for the public awareness-building programs is delivered through the public media, mainly via radio and television. This sort of public awareness program is very influential in shaping public attitudes towards environment issues.
Conclusions

The Lao PDR government is currently undertaking an ambitious program to transform and diversify the country's largely resource based economy while at the same time maintaining macro-economic stability and pursuing economic growth. The economic base is currently narrow and depends primarily on the exploitation of natural resources such as agriculture, forest products and hydropower. Sustainability of the socio-economic development is thus closely dependent upon a comprehensive natural resource management policy. Environmental planning and management therefore must be integrated into the overall social and economic development of the country.
Environmental education and awareness

Environmental education strategies need to mobilise all the elements that constitute the formalized methods of education within Cambodian society including: formal schooling, mass media and socio-cultural elements like religious networks, and professional and occupational training. The target audience can be divided into two main groups: government officials and decision makers, and the public at large. The latter group is covered by the formal education sector and the public awareness sector.

Government officials and decision makers

One of the most urgent problems facing the Ministry of Environment is the lack of skilled officials to carry out the tasks of the Ministry. The Ministry of Environment in collaboration with UNDP/ETAP, IDRC, UNESCO, and IUCN has organized some lecture programs on general environmental issues. To date there have been three programs with the following objectives:

- to ensure that the Ministry of Education staff understand and support the mission and goals of the Ministry of Environment;
- to ensure that the staff of the Ministry of Environment know of the functions of each department and office of the Ministry; and
- to increase the competence of the environmental staff through involvement with the full range of problems, sciences and technologies related to the environment.

Formal education sector

Environmental education in this sector should not be seen as a subject in itself, but as a function of education, with content that is delivered through various broad learning areas in the curriculum. The formal education system consists mainly of public or private primary and secondary schools, and public or private higher educational institutes, and Buddhist schools. Formal education is implemented by the Ministry of Environment and the Ministry of Education, Youth and Sports in cooperation with UNDP/ETAP and UNESCO.

Public awareness

The promotion of public awareness in Cambodia can be organised by means of the media of television and radio. To ensure effective quality, however, information campaigns on the environment and journalists with specialized education in environmental issues are prerequisites. In May 1994, IDRC assisted the Ministry of Environment to formulate action plans for educational and communication activities through mass media and informal education. The main goals of the activities are:
to address immediate environmental problems facing communities in both rural and urban areas of the country such as deforestation, water supply and water quality, danger of pesticides, and sanitation issues;

to share quickly with policy makers and officials involved in facilitating industrial and trade investments the experience of other countries with environmentally friendly and environmentally damaging industries and trade; and

to develop environmental models with close cooperation with related institutions, especially with the Ministry of Environment, the Ministry of Agriculture, Forestry and Fishery, and the Ministry of Health.

Environmental impact assessment (EIA)

Implementation of EIA will play a vital role in environmental management and it will help agencies responsible for environmental protection and natural resource management to meet better the requirements and objectives of sustainable development. EIA should contribute as an integral part of a plan, program or project throughout the reconnaissance, feasibility, and design levels. The EIA process should report likely consequences of specific actions and allow for the development of alternatives where significant adverse effects will not be caused or where such effects are mitigated.

The Cambodian Government has to develop an EIA process at the national and provincial levels with the assistance of ADB, UNDP, and USAID, as they continue to assist the Ministry of Environment to prepare Environmental Legislation that includes the implementation of the EIA process. EIA training will be promoted for those who will become environmental experts in this sense. The CDC, in collaboration with the Ministry of Environment and other involved Ministries, conducts EIA analyses and makes decisions on whether to implement proposed projects and investment.

Sustainable development

Cambodia's rich natural resources, biodiversity, forest, hydrologic system, inland and coastal fisheries, and land provide a significant base for the country's development. At present, however, valuable natural resources of the country have been irrationally exploited and could disappear in the near future. Unsustainable use of natural stock would result in environmental degradation hindering the economic growth and affecting food security and the livelihood of the local people. So, the link between environment and economic development is clear as economic decisions impact the environment and good environment impacts the performance of the economy.

For development to be sustainable several actions need to be taken, including the following:

- economic policy (price regulation) for pollution charge, tax (effluent charges, user charges, product charges);
- inclusion of social cost pricing for environmental improvement to the prices of goods and services;
- integration of EIA into a program or project; and
- the establishment and enforcement of environmental standards.

Failure to incorporate the total worth of environment in cost-benefit analysis will result in unnecessary damage to the environment.
Public participation

The Environmental Law encourages and provides opportunity for public sectors or international organisations to participate in environmental protection and natural resource management. Cambodia's National Tree Planting Day (9 July) and Keep Cambodia Clean Week (December) are examples of public participation.
MYANMAR'S STRATEGIES ON ENVIRONMENTAL EDUCATION

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Introduction

Environmental education is an important factor in promoting public authorities' interest on environmental matters and involving the public in sustainable development activities. The rise in environmental awareness throughout the world in the past 20 years and the resulting environmental conservation efforts have been mainly due to the environmental education promotion activities carried out by UNEP, environmental NGOs and the subsequent environmental promotion and awareness campaigns of the governments in various parts of the world.

In Myanmar, the main institution involved in promoting environmental awareness in the country is the National Commission for Environmental Affairs (NCEA) established in February 1990.

The environmental consciousness is more or less ingrained in Myanmar people through Buddhist teachings. In Buddha's teaching, planting of trees, making gardens and parks, constructing bridges, digging wells, building rest houses and monasteries are described as acts of merits. Historical records show that environmental conservation works were initiated by the last dynasties of Myanmar kings who with far-sightedness proclaimed the valuable teak forests as royal property and levied royalties for the teaks properly extracted under royal permission. Conservation of biological diversity in Myanmar also dates back to 1860 when King Mindon established 17,500 acres of sanctuaries.

Environmental awareness promotion measures in Myanmar

Despite Myanmar's long history of consciousness over nature conservation, there was no central coordinating body for cross-sectoral coordination in environmental matters or for promotion of environmental awareness in Myanmar until the establishment of the NCEA. The Commission acts as the national focal point for environmental matters and co-ordinates the work of various ministries and departments and more importantly carries out environmental awareness promotion activities in the country.

The Promotion of environmental awareness is one of the main areas of concentration of the current activities of the NCEA. A strategy to inform the public about different environmental issues, and to motivate community involvement in environmental matters calls for increased environmental education through the use of the media. The mass media, including television, radio and press, are effective educational instruments because of the variety of information they can pass on to their audiences and the technological means available to attract and keep their attention. The NCEA and various Government ministries, particularly the Ministries of Information, Education and Forestry, have been promoting environmental awareness through the mass media. The general public is also becoming more involved in environmental protection and conservation measures. The celebration of the World Environment Day is also one of the most important activities of the NCEA to draw public attention to environmental matters. The World Environment Day activities in Myanmar include photographic and literary competitions, exhibitions, and TV and radio programmes. Information on environmental affairs and environmental education are also distributed to schools and to the Government information centres throughout the country. NCEA officials also give educational talks on environmental matters as part of the World
Environment Day celebration. Environmental awareness efforts undertaken by NCEA also include holding of environmental workshops, seminars and conferences to promote environmental education among the Government officials.

Public awareness and public participation can be promoted through non-formal education. Environmental programmes will not be effective without public awareness of the importance of environmental conservation and without the public’s active participation. One of the most significant measures to promote environmental awareness and public participation in environmental conservation in Myanmar is the nation-wide afforestation programme. These efforts have been redoubled since the UNCED held in Rio de Janeiro. In 1992 a high level Central Body for country-wide planting of fast-growing trees was formed to coordinate this task. These fast-growing trees are planted for fuelwood and it is expected that they will provide the energy needs of the rural population and slow down the rate of deforestation since about 11 million fast-growing trees have been planted across the country every year with public participation.

Both formal education (Basic and Higher education) and non-formal education are indispensable in changing people's attitudes, in order that people have the capacity to assess and address their sustainable development concerns. It is also critical for achieving environmental and ethical awareness, values, attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making. Training is also one of the most important tools to develop human resources and facilitate the transition to a more sustainable world. Training programmes should therefore promote a greater awareness of environment and development issues.

Myanmar, unlike most of the developed countries, has no special training centres for environmental education. At present Environmental Science is included in the curricula of the Biology and Chemistry courses at the University. An Environmental Engineering course is also given at the Yangon Institute of Technology. At the middle school level, students also learn about air pollution, water pollution, forestry and ecology in their Science Subject. There is, however, still a need to promote more environmental education curricula in school and colleges. The establishment of specialized degree courses in the field of environmental sciences and the training of teachers on this subject is most essential.

Conclusion

At present, Myanmar is making efforts to formulate Myanmar Agenda 21 and to promote the inclusion of environmental education as one of the programme areas of the Agenda. The following activities are envisaged in the programme:

- To set up simple courses and syllabuses on environmental education for basic education and advanced courses for higher education level.
- To achieve primary education for 99 per cent of children of primary school age through formal schooling or non-formal education; efforts should focus on reducing illiteracy levels.
- To conduct environmental training for teachers.
- To involve school children in local and regional studies on environmental health, including safe drinking-water, sanitation and food and ecosystems, and in relevant activities, linking these studies with services and research in national parks, wildlife reserves, ecological heritage sites etc.
- To establish in Universities and Institutes, departments for environmental and development education.
- To achieve environmental and development awareness in all sectors of society on a country-wide scale as soon as possible.
- To strive to achieve the accessibility of environmental and development education, linked to social education, from primary school age through adulthood to all groups of people.
To promote the integration of environment and development concepts, including demography, in all educational programmes, in particular the analysis of the causes of major environment and development issues in a local context, drawing on the best available scientific evidence and other appropriate sources of knowledge, and giving special emphasis to the further training of decision makers at all levels.
The Environmental Problem is the greatest global problem for all mankind. Only by everybody accepting their common responsibility will the environment be protected. Besides having good legislation to protect the environment and good management to implement these laws and regulations, it is essential to develop environmental education greatly in order to improve human beings' environmental consciousness and ability to participate to protect the environment of the earth on which human beings rely.

Environmental education is an education about quality of living for people as well as a social and moral education for them. Its aim is to enhance environmental consciousness among all people. Environmental consciousness involves basic knowledge and an attitude that exists in the people's minds. It not only reflects a level of understanding of environmental problems and the imminent dangers in them, but also embodies an awareness of action that protects the environment.

Environmental education itself has two characteristics - "whole people wide" and "whole process wide". "Whole people wide" means that all people from all places and all classes need to be educated to have this environmental consciousness. "Whole process wide" means that the people accept that environmental education is an ongoing process throughout their whole lives, from childhood through teenage, young adulthood, middle age and on into old age. In these senses all people need to have some knowledge about environmental science so that everybody can have personal control and not be destructive of their environments.

In circumstances where environmental education is attended to, and where environmental consciousness is kept in mind by everyone, the environment is well protected. Environmental protection and education must interact and support each other.

In underdeveloped countries it is not possible to have all people finish the high school education and graduate from college before they go to work. Without a booming economic situation most people are struggling to survive. In these countries many methods that seem to ignore the environment are taken by the government to expand the economy, to save the people and to strengthen the nation. Though a few environmental actions may be put into effect their result is tiny, and the quality of the environment is destroyed in many areas. Therefore there is a very great need to stress the importance of environmental education in the training of those few who do have tertiary education, because of the critical responsibility they have in the developmental decisions that are being made.

In China great attention is paid to protecting the environment by the national and the local governments, and environmental education is written into the working schedule. In environmental education we think that the "whole process wide" is very important, but we also recognise that the school age is a key period. We are then training from childhood, environmental personnel who will be working in the 21st century. Regulations were issued by the National Bureau in the Conference of National Environmental Education in 1992 as follows:

"the environmental education has a relevant part in the school program and needs to be stressed, and reinforced in the new situation. From now on, a qualified student should understand some environmental science knowledge, otherwise he would not graduate".

We use different methods with different age groups based on their age and ability. First of all, some textbooks have been designed for the youngest children who are in the kindergarten. The method of
teaching in them is by simple and easy games and by audio-visual means. For the elementary school students, environmental education is combined with the study of natural knowledge. In the middle school, an infiltrating method is used. The environment is 'seeped' into courses of physics, chemistry, biology and geography. At the same time, the teacher also uses some local examples to help to develop environmental consciousness in the students. At the college level, environmental science is a required course in many fields of study. The Qinghua University, Beijing Teachers University, Zhejiang University and Chinese Textile University have opened to all students an elective course, *An Outline of Environmental Science*.

The system of environmental education is being developed in ways that feature a multiplicity of patterns and many sides. The system can be divided into four parts. The first part is the education of professionals. The second part is concerned with post-training and technology training. The third part is universal education, and the fourth part is social education using the mass media. In China some of our experiences in environmental education have been confirmed and commended by the United Nations Environment Program. Nevertheless, we are not satisfied, because we realise that, until the environmental consciousness is at the highest level in the minds of all our citizens, we have not done well enough.
ENVIRONMENTAL EDUCATION - A RESPONSE TO THE ENVIRONMENTAL SITUATION

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Introduction

In this paper I explore the idea that Environmental Education is a Response to the Environmental Situation. This statement has commonly been used to characterise Environmental Education on the world scene in the 25 years since the Stockholm Conference of the United Nations on The Human Environment recommended that programs in environmental education (EE) should be developed at all levels of education that would provide their participants "with means to manage and control their environments".

In particular, I explore the idea of response to the environmental situation in relation to what has been done and what still needs to be done at the level of higher education. In the first part of the paper I consider aspects of higher education itself that have controlled the nature of the response that universities and other higher education institutions have made to the challenge of the Environment. In the second part, I consider how our understanding of the nature of the Environmental Situation has changed, and how this has conditioned, and ought to be conditioning, the EE response of higher education.

The educational context

Paradoxically, higher education has the potential to make the greatest response, but it has, hitherto, in many countries made the least of all the education sectors. Its high potential derives from the fact that universities have the most advanced and up-to-date knowledge and much of the best expertise in the broad range of fields that need to be drawn on if the complex web of issues in environmental situations are to be resolved or avoided. The failure of higher education, in general, to engage in EE is largely due to an inherent conservatism that stems from the disciplinarity of universities' pursuit, and transmission, of knowledge.

Environmental situations involve intricate webs of biophysical, social, political, economic, and psychological elements. Any adequate educational response to this complexity must combine knowledge and skills from a range of disciplines. It is this type of inter-disciplinarity and integration of knowledge that universities find so difficult. Internationally, the greatest responses to the challenges of the great meetings that defined EE - Stockholm (1972), Belgrade (1975), Tbilisi (1977) and Moscow (1987) - have been in the sectors of primary schooling and general and community education. These sectors are the least influenced organisationally or philosophically by the analytic and disciplinary approach to knowledge and its learning and teaching. It is thus now common to find countries, regardless of their degree of industrialisation, that have organised their primary curriculum into large blocks, one of which carries a title like Environmental Studies. The teachers regularly make use of environmental situations, both very local ones and wider ones, to teach knowledge and skills that earlier were taught in more discrete independent sections of their timetable. Malaysia, for example, has established such a large block called Man and His Environment, that includes learning's from science, health, mathematics, history and geography. Moreover, the inclusive, one-teacher-per-class pattern that is so common in primary schooling also gives this sector a great organisational advantage for EE.
Undergraduate programs

The disciplinary conservatism of the older, more traditional universities has meant that it is quite uncommon to find in them undergraduate degree programs that are explicitly related to the Environment. Since these universities also often have the highest status as educational institutions they attract the highest achieving students from school and this important pool of talent is thereby excluded from environmental studies, at least at this early stage of their higher education.

Some of the newer universities that were established in the expansive 1960s and 1970s do, however, have such environmentally directed degree programs. These programs helped to give these new universities a distinctive character as they sought to establish themselves and these courses did attract groups of young and more mature students who had an interest in, and a commitment to, the environmental concerns that were now a regular feature of the public consciousness. These degree programs usually include a wide range of studies from the biophysical and social sciences and require a major sequence to be studied that relates to an important dimension of environmental action like Land and Water Processes, Pollution and Health, Environmental Planning, Social Policy and Development, and so on. One description of these courses is that they lead to graduates with "a high degree of specialisation in their chosen discipline whilst providing a strong environmental awareness". Because of the academic immaturity of the students and because many of the subject units they study outside of their major are drawn from other undergraduate programs, the knowledge they acquire from them is useful and relevant but it is not chosen to help them gain insight into how knowledge is conceived and developed in other disciplines, and hence to appreciate their strengths and limitations.

Environmentally explicit undergraduate programs are also now quite common in polytechnic institutes but, in keeping with their more vocational character, the focus is usually narrower with a more tightly prescribed set of supporting studies and a concentration on knowledge and skills that relate to the practices of technologies that are now in regular use monitoring or dealing with environmental damage.

Double degrees

In a number of countries there is now both a strong demand for well qualified graduates and a competition between graduates for positions. Universities have recognised these two complementary pressures and as a result in many of them it is now possible to do a double degree program in one or even two years less than it would take to do these two programs separately. Such a dual training makes these graduates particularly attractive to employers working in developing situations the parameters of which are flexible and not so established as more traditional specialist ones are. There are also obvious advantages here for EE in that the graduates can acquire, by suitable degree combinations, a broader professional preparation in two fields that both interact directly with the Environment, for example, Engineering/Law or Biological Science/ Social Development, etc. As such graduates move on to enrol in masters courses they will produce an impetus for these programs to take advantage of their dual backgrounds.

Post-graduate programs

It is at the post-graduate level that some of the more traditional universities have been prepared to provide a programmatic response to the Environment. Masters degrees have been set up that enable graduates from a wide range of disciplines to embark on studies that provide them with an introduction to a set of disciplines other than their own, that are of direct significance to environmental situations. These courses also include some core studies that are directly environmental and project units that develop their knowledge and skills of contributing as a disciplinary specialist in multi-disciplinary teams that are
working on environmental problems. The academic maturity of these students has made it possible for some very novel units to be developed by interested staff. These are introductory in the sense of the students not having studied in this disciplinary area before. They can, however, still be designed in such a way that the nature of the discipline is explicit, because they do not have to provide a complete foundation from which a major study in the discipline is built. The students become familiar with some of the conceptual language of this other field, the types of questions that are asked in it, and the sort of knowledge bases and procedures that these professional use in answering them.

It is the fact that the students in these courses usually already hold a disciplinary degree that made them acceptable in what are very disciplinary-organised universities. There is still the structural problem of where these programs are located and how they are administered and staffed. A number were begun in the enthusiasm of the 1970s as cross-faculty centres, but it is significant to note that several of these have subsequently been relocated in a single faculty or department. This gives them more stability, improves the career prospects of their core staff, and makes doctoral studies more possible. On the other hand, it tends to weaken the support that other departments will give to the specialised teaching demands of such a program, and makes it that much more difficult for interested staff from these departments to be involved.

Professional degrees

At the Intergovernmental Conference UNESCO-UNEP in Tbilisi in 1977, there was strong recognition of the fact that the work of a wide range of professionals had quite direct effects on the long term quality of the environment. Professions like Law, Engineering, Architecture, Town Planning, School Teaching, Agriculture, and Economics and Accountancy were examples of these and each had their own well-established programs of study for their students to follow. In 1977 the persons responsible for these professional programs in higher education were not participating in the discussions about EE.

One of the key models for developing EE was the idea that there should be an environmental dimension in all subjects of the curriculum of learning rather than the alternative of a separate environmental subject. Translated to the level of the programs of professional education, the model of an environmental dimension meant that each professional course should explicitly acknowledge the Environment by including in its program of studies a unit or units that directly addressed the interaction these professionals do have with the environment. There was, thus, a concerted move via sympathetic individuals and the various professional institutes to promote this possibility. The response was not rapid reflecting again a conservatism in higher education that extends beyond that already referred to in respect of the pure disciplines.

The first steps came when optional units on Law and the Environment or Engineering were introduced in the later years of these programs. The interest that students showed in these units, and the emergence of increasing environmental regulations that affected the work of professionals, combined to establish these environmental units as a now quite common mandatory part of the basic education of a wide range of professionals. As these environment units became compulsory their content also changed. For example, Environment and the Law became Environmental Law. What was a unit in which possible relations were explored had become a unit in which an increasing body of laws and regulations could be talked about as a significant aspect of the society in which these students would soon practise.

Although these units in professional courses are of necessity a highly specialised and sectional view of Environmental Situations, they can assume a very strong knowledge background in the students. The graduates from these courses will increasingly be interested in further environmental studies at the masters level. The interdisciplinary nature of these masters programs has already been noted and will be very beneficial to these specialised professionals. However, apart from the project work little has been done in these masters courses to include a continuation or an updating of the depth study these persons have
already experienced at the undergraduate level. The chance to develop such advanced optional units as part of masters programs in EE should appeal to university departments and faculties because of their intellectual challenge but will be hampered by the fact that at any one time there may be only a small number of students desiring to take them. One way to meet this next step in the development of the postgraduate level response to the Environment could be through short intensive courses.

Short courses

In many institutions of higher education there is a quite well established tradition of running short intensive courses for updating professionals in fields within the institutions' range of expertise. Although these have often been run from departments or faculties, and hence have a very specialised character, they are not subject to the regulatory or organisational constraints or the academic expectations to which I referred at the beginning of this paper. They thus have a great potential for furthering EE at an advanced level, both as specialised professional units, or as team taught forums that set out to produce interaction between different professionals on environmental situations and issues. There is considerable encouragement from outside universities for them to find ways to give recognition to serious participation in these sorts of courses if the persons involved are currently enrolled in, or soon after enrol in the formal masters programs. If this is possible, the problem mentioned at the end of the last section can be solved.

Changing conceptions of the environment

Environment as ecosystem

The second way I wish to discuss EE as a response to the Environmental Situation is to consider how the understanding of that situation has changed and hence, how the educational response has changed, or ought to be changing. The changes in understanding of the Environmental Situation do not mean that one understanding replaces another. Rather, it is a case of an enlarging or deeper understanding emerging, and so, the educational response at one stage remains valid, but insufficient. It needs to be extended by other types of contribution from education.

The first responses of formal education in the early 1970s were consistent with a view of environmental situations as ecological systems. This became known in due course as Education about the Environment. Such a response in which environmental situations were treated as ecological systems was already familiar in disciplines like geography and some biological sciences. The environmental situation was an object of study, and like other ecological systems, the approach to its study was by analytical procedures that were very familiar in universities' approaches to knowledge.

Environment as problem

The limitations of this view of the Environmental Situation, and hence of this objective, analytic Educational Response were quickly challenged in a debate about Education about the Environment versus Education for the Environment. The Belgrade Charter in 1975, in particular, identified environmental situations in terms of the Environnementale Problematique. Environmental situations were problems to be solved, not merely studied. Education for the Environment meant education that would so involve the learner in the problems of the situation that they would acquire the knowledge and skills for its solution and the commitment to so use them. It was education for the sake of, or for the good health of, the environment.
Problem-based education was not unknown in universities, and about this same time there was a quite wide-spread interest in some experiments in medical and management education that were problem-based. More generally, the research component of higher degrees was problem-based. On the other hand, almost all initial undergraduate courses were based on objective and analytical approaches to teaching and learning, and dealt essentially with a stable and well established body of knowledge and skills. Masters degrees by course work were becoming common during the 1970s in response to the demand from professionals for courses that would update their knowledge. These, too, were thus seen as an extension of the approaches in undergraduate teaching and learning, and not as an opportunity for quite different approaches to pedagogy. Their fit was with Education about rather than Education for.

The environmental undergraduate programs in the newer universities and the polytechnic institutions do have some elements of Education for as well as the Education about that makes up most of their course units. Students do acquire problem detecting and problem solving skills, but their degree of specialisation can often over-simplify the nature of environmental situations, and leaves significant aspects of its overall problem nature undetected and unresolved.

The masters programs that aim at producing broadly based environmentalist who can work in multidisciplinary teams are a response to a more total recognition of the problem nature of environmental situations. The breadth of their course work units aim to provide multi-disciplinary Education about the Environment, but also education about the expertise and knowledge bases that people from different disciplines can bring to bear on environmental problems. The group or team project component of these courses is also a more effective case of Education for, because it leads not only to experience of the use of the student's specialised skill in problem solving, but also to experience of defining and sharing the solving of the problem in a multi-disciplinary sense.

Environment as sustainable development

In 1983, a small working party of the World Council of Churches meeting in Romania began to use the term ecologically sustainable development in their report on the Environment. This way of thinking of environmental situations has grown in the years since, and was accelerated by the Brundtland Report (1988) to the point where it became orthodoxy and at the heart of the United Nations Conference on Environmental Development (UNCED) in Brazil in 1992.

Although there have been a number of reports on EE for sustainable development, and a number of university programs now include the term in the descriptions of their courses, it is probably too early to see what sort of educational approaches are, in fact, responses to this new view of the environment, and which are merely subsuming it into their existing nature.

One indication of what an appropriate response might be is the recently announced Master of Philosophy degree in Sustainability, Recycling of Buildings and Materials at the University of Salford in England. Without more detail of how technocratic or how philosophical this course is, it is not possible to make a judgement about it, but ideas in its title may indeed be important for those seeking to define higher education's response to this view of environmental situations. There are very substantial philosophical issues in "sustainable development" that are not raised by other statements of the environment. If the "sustainability" is prefixed by "ecologically" the issues change again. The word "development" also holds open the question of the "not yet", and so puts the choice of alternatives as a priority of concern and attention compared with simply solving existing problems in the environment.

Prevention not just cure becomes the goal, to use a medical analogy that is still struggling for its adequate share of the health dollars in all countries. Environmental Planning may need to take precedence over Environmental Management, if the latter is only concerned with the current, and attempts merely to
minimise problems. Many communities now have recycling programmes for household waste, bottles, paper, plastics, and metal. Hitherto, there are, however, only a few who have tackled serious recycling of buildings and materials, and these words in the title above could mean a radically new emphasis, even if this course is more technocratic than holistic. The ideas of Permaculture - sustainable agriculture - have as yet received little attention in degrees in Agriculture, and this could be another form the response to the Environment as Sustainable Development ought to take. Finally, a number of countries are now legislating to make manufacturers responsible for their products in an environmentally sustainable sense from their choice of raw materials to their recycling after use. If the targets of the Montreal Convention and of UNCED are to have any chance of being reached, energy conserving will have to be of prime concern at every one of these stages of a product's life cycle. Engineering and other training for the manufacturing industries will need to be very different from their present profligate disregard of these matters.

**Environment, Population, Social/Economic Development**

Another major shift in thinking about the Environment has been gradually surfacing since the Brundtland Report and UNCED. It is that global themes like the environment, population and social/economic development are too intricately intertwined to be dealt with effectively, or even considered seriously, on a separate basis. In order to make headway with them, an integrated approach that takes them all into account is needed. The Cairo Conference on Population and Development (1994) and the World Summit on Social Development in Copenhagen (1995) both emphasised this view.

EE is now challenged yet again by what this integrated approach means for the educational response of higher education. I know of no examples to share with you, and so must leave us all with the task of considering how we may help our institutions of higher education continue into the 21st century to be relevant to these most pressing issues for the world's societies.
THE AUSTRALIAN EXPERIENCE IN UNDERGRADUATE AND POSTGRADUATE COURSES IN THE ENVIRONMENTAL AREA

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Introduction

Australian environmental education at the university level is expanding rapidly and in a rather haphazard manner. A 1993 survey by Drs L. Cosgrove and I. Thomas asked coordinators of environmental courses in Australian universities a range of questions about the courses that they administer. Despite a response rate of only 40%, the 1993 survey identified more than 40 undergraduate courses in the environmental area and almost 20 postgraduate courses. These courses covered the four broad areas of Environmental Studies (8 undergraduate; 10 postgraduate), Environmental Science (29 undergraduate; 5 postgraduate), Environmental Engineering (5 undergraduate; no postgraduate), and Environmental Education (1 undergraduate; 2 postgraduate). Many new courses have appeared even since the 1993 survey, and continue to do so. Another recent compilation, Directory of Environmental Courses in Australia, published by the Environmental Protection Agency, lists many Australian courses in the environmental area.

These environmental courses have been established for a range of reasons, including in concerned response to the environmental crisis that the Earth is facing, as well as in response to the high profile that environmental issues now have in the news media and with the public at large. The latter reason is being used to attract students to the new degrees. Some universities are modifying and re-packaging their standard degrees as environmental degrees, particularly at the undergraduate level. Other programs are genuine responses to real and pressing environmental issues and aim to produce graduates that genuinely care for the environment and seek to do something to address environmental issues. The latter type of degree commonly includes an explicit aim of developing a caring attitude towards the environment and taking action to address environmental issues.

The growth of environmental courses in Australia, the USA, Great Britain and other countries will almost certainly be followed by a similar development of more environmental courses in the Mekong region. This likelihood, and an objective of the UNESCO Chair that it serve the region, prompts the following review of the nature of the various undergraduate and postgraduate environmental programs in Australia. An important aim of this review is to provide insights into the positive and negative features of the Australian experience with environmental courses at the university level, and thereby to help the region to optimise the quality of its environmental courses as they are developed.

Undergraduate courses

General points

The environment is unlike most other areas in undergraduate university education in that it is multidisciplinary or interdisciplinary. As noted by Professor Peter Fensham elsewhere in these Workshop Proceedings, many undergraduate programs in environmental science or environmental studies reflect an institutional conservatism in the universities that makes it difficult for the institutions to embark on interdisciplinary studies at the undergraduate level. Students are, in effect,
socialised into the disciplines at the undergraduate level, where the bulk of an Australian academic's teaching work has traditionally been done. Even relatively simple disciplinary combinations that are not at all profound in the true interdisciplinary sense (combinations such as Biological Sciences and Chemistry, or Geology and Physical Geography, for example) have often been difficult to achieve to any satisfactory depth in the traditional university structure in Australia. Academics have concentrated on protecting their own disciplines by seeking to maximise student enrolment in them, largely because student numbers are the fundamental mechanism for budgetary allocations in Australia. This tendency to protect the discipline by maximising student numbers is particularly the case in the senior undergraduate years, and even more so when the student seeks to obtain a so-called 'double major' in two Faculties. The latter is often prevented by regulations that do not permit students to take senior undergraduate courses in more than one Faculty, effectively making it impossible for the student to undertake studies in the biophysical and social dimensions of the environment.

Three broad types of undergraduate degrees in the environmental area may be recognised in Australia:

i. degrees that follow a traditional discipline base (e.g., physics, chemistry, ecology etc) with some attempt to develop environmental awareness in the students or at least to address environmental issues;

ii. degrees that are based in an Environmental Faculty and which seek to develop a strong base in a Major area of study, as well as a high level of awareness and skills in the environmental area; and

iii. degrees that are interdisciplinary and inter-Faculty, and explicitly do not seek to develop a disciplinary base but to develop interdisciplinary skills.

These will now be addressed in some detail so as to make clear their differences and relative advantages.

Traditional, discipline-based BSc in the environmental area

The traditional BSc degree in Australia generally covers four subjects in the First Year (e.g., Physics, Chemistry, Biology and Geology), three of these in the Second Year, and two in the Third. The discipline-based BSc environmental degree follows this standard BSc structure with two principal differences: subjects may be restricted to those that would be regarded as 'relevant' to the environment (e.g., Chemistry, Biological Sciences, and Earth Sciences), and one or two compulsory 'core' subjects are included to address environmental issues (these may not be available to students taking the standard BSc). These special subjects may include one course at the Second Year level and one in the Third Year, covering areas such as environmental issues, environmental policy, environmental monitoring, environmental law, etc. These special courses may or may not be linked to the other areas of study, so it is difficult to know whether students will gain any deep understanding of the complexity and multi-faceted nature of environmental issues.

A variant of this structure simply lists coherent groups of courses from the biophysical areas in the Sciences, supplemented with courses in allied areas, such as Law, Economics, Social Science, Conflict Resolution, and so on. This structure has no compulsory 'core' area of common study, which is probably a shortcoming. The students are not exposed to any of the epistemological questions related to the discipline areas in which they are working, nor do they necessarily develop a caring attitude towards the environment nor the motivation to undertake action for its repair or betterment. Moreover, in both variants of this degree structure, the discipline-based studies do not necessarily address environmental issues explicitly.
A BSc in an Environmental Faculty or School

This type of degree is rare in Australia because very few universities have a Faculty (or School) of Environmental Studies (or Environmental Science) containing all the disciplines relevant to a study of the environment. One good example is an Australian university which has an Australian School of Environmental Studies, with academic staff covering areas such as the social sciences, the biophysical sciences, policy, law, economics and modelling. The structure of the degree may be different to the traditional BSc degree outlined in the previous section. In the BSc in the Australian School of Environmental Studies, all students take a common core of subjects in their first year covering human society, the biophysical sciences and the biophysical environment, environmental policy, statistics and computing, environmental studies, and scientific enquiries and communication. In their second and third years, students study a selected combination of subjects, about 40% of which must form a ‘Major’ study. The areas covered in the second and third years (and therefore the possible Major studies) include social policy and development, pollution and health, ecology and its applications, land and water processes, environmental planning, environmental policy and economics, and quantitative environmental modelling.

This degree structure is quite different to the traditional, discipline-based degree in several important ways. Firstly, the degree is multidisciplinary and is taught by staff from a wide range of disciplines. Secondly (and unlike in the traditional university and BSc structure), these staff are all part of one administrative unit (the School) which gives the program great coherence and an explicitly multidisciplinary character. This is consistent with the School’s stated aim:

Recognising the interconnection between human systems, human actions and biophysical systems, the School seeks to transmit and extend knowledge of the basic structures and processes in nature and in human society and of linkages between them. The School recognises that the knowledge, skills and perspectives of a wide range of disciplines contribute to this mission. The School is dedicated to the promotion of interdisciplinary research and teaching in diverse areas of environmental scholarship and management, all contributing to maintaining the health, well-being and sustainability of ecosystems and communities in Australia and internationally.

Thirdly, caring for the environment and the promotion of sustainability are explicitly identified in the School’s goals. Fourthly, the Major study required of each student may be quite unlike the Major in the traditional BSc (for example, Chemistry or Geology), covering areas like pollution and health, and land and water processes; these have not usually been Major areas in the traditional BSc degree.

Interdisciplinary Bachelor degrees that explicitly seek to develop interdisciplinary skills

These degrees are very uncommon at the Bachelor’s level in Australia. One example is provided by a Melbourne university’s Bachelor of Social Science (Socio-Environment Assessment and Policy - SEAP). This degree is interdisciplinary, being taught jointly by two Departments from two Faculties: the Department of Policy, Planning and Landscape from the Faculty of Environmental Design and Construction, and the Department of Social Science from the Faculty of Social Sciences and Communications. Its objectives are:

- To provide students with a critical understanding of the inter-relationships between human need, human society and the natural and socially created environment.
MEKONG REGION ENVIRONMENTAL ISSUES AND EDUCATION

• To relate the educational program to the experience of, and involvement in, current industrial, government and community concerns in the environmental area.
• To prepare students for careers in industry, community organisations and governmental agencies in relation to the formation of competent and responsible environmental analysis, assessment, policy and strategies.

These objectives are achieved by the study of four major areas:

1. Social Science (First, Second and Third Years, including core subjects and electives in sociology, political science and urban studies);
2. Environmental Studies (First, Second and Third years, including studies in ecology, environmental management, and environmental policy);
3. Integrating Studies (Social studies of science and technology, including environmental issues, philosophy, sociology, political economy, and policy in relation to science and technology); and
4. Applied Research (First Year: Social science research methods; Second and Third Years: Two interdisciplinary group projects; Third Year, Final Semester: Individual research project)

One of the most interesting statements in the brochures and publicity for this program is:

SEAP aims to take an interdisciplinary approach to environmental concerns. SEAP does not attempt to provide graduates with an in-depth specialised knowledge in either social science or environmental science.

At the end of the course, students have gained skills in social research, problem solving and policy issues and processes as applied to environmental concerns, as well as knowledge of social and ecological processes, theory and issues. This equips graduates for a wide range of positions and duties in a number of professional areas.

This degree is quite clearly very distinctive from the discipline-based BSc in environmental issues. It focuses on the complexity of environmental issues, focussing on the necessity for a multidisciplinary approach to addressing them. Rather than providing the student with a strong base in one discipline (which, it must be said, is now often quite narrow in the Australian university structure), the SEAP program aims to promote thoughtful analysis of environmental issues and the skills to deal with environmental problem-solving in a multidisciplinary context. The course has an emphasis on practical community concerns and case studies, as well as academic excellence. It is quite different from other courses in its emphasis on social and environmental research and policy through an interdisciplinary approach to environmental issues.

Summary

Undergraduate environmental degrees in Australia range from the traditional, discipline-based structure to the broad multidisciplinary program. Most courses are the discipline-based BSc degrees with an environmental emphasis deriving either from the range of subjects that are offered or from a small core of subjects for the environmental students.

The slowness to develop less traditional structures reflects several factors, including the following:

• the relative inexperience of many academics in the multidisciplinary domain, and their unwillingness or inability to set up programs and/or to work in a multidisciplinary context;
the speed with which environmental courses have been appearing in Australia, which stands in strong contrast with the considerable time it takes to develop a properly integrated multidisciplinary course program;

the organisational complexity involved in running multidisciplinary programs, involving coordination of the various teaching inputs, as well as the students’ multidisciplinary project work;

the fact that the multidisciplinary approach is often identified in Australia with a ‘caring for the environment’ stance and an involvement with action for the environment, both of which make some traditional, discipline-based academics uncomfortable, or are seen to be inappropriate as key elements in an undergraduate university program; and

the epistemological complexity of multidisciplinary teaching and research, in relation to the view that undergraduate students are not ready for this level of complexity, which is more appropriate at the Master’s level.

We now turn to the Master’s level courses.

Postgraduate courses

Introduction

Postgraduate courses in Australia consist, from ‘lowest’ to ‘highest’, of the postgraduate Diploma (generally one year), the Master by coursework only (one to two years), the Master by coursework and research (one to two years), the Master by research thesis (two years), and the Doctorate (by coursework and thesis or thesis alone (three to four years)). Students may undertake a research Master’s or PhD by thesis in the environmental area but we are not concerned with these here. We will focus our attention on the Master degrees by coursework and project.

These so-called ‘coursework’ degrees can be seen to break down into two broad groups:

i. programs which focus on a higher level of knowledge and capacity in the environmental area (including an awareness of multidisciplinarity); and

ii. programs in which the core concerns are the multidisciplinary complexity of environmental issues, and the necessity for an epistemological component in the degree, including a knowledge of the ‘social construction’ of environmental issues and their ‘treatment’.

Master degrees to develop a higher level of knowledge and capacity

These programs have aims such as the development of:

- the concepts and skills for studying and resolving environmental issues;
- an understanding of environmental management, planning and policy analysis;
- skills for integrating perspectives from natural and social sciences for impact assessment and environmental management; and
- an ability to exercise professional leadership in environmental management.

Core subjects in such a degree might include ecology; environmental planning, law and policy; social and environmental impact assessment; environmental economics; land and water resources planning and management; environmental pollution and health; and research design.

These courses generally do not include an objective related to caring for the environment and the engaging in action for the environment. They are more related to the development of knowledge and
skills in analysing environmental issues, and the treatment of these issues and the planning of responses to them.

**Master degrees with an epistemological component**

This type of degree shares many elements with the preceding, with the additional component of an examination of the nature of knowledge about science, society and environmental issues (the epistemological component). This type of program may therefore aim, for example, to develop in graduates a sensitivity to the context in which understanding, methodologies and skills arise. In other words, this type of program is based on the belief that the ways in which we perceive and understand the environment (defined broadly as including the biophysical and social environments) determines how we approach and interact with the environment, as well as the strategies that might be developed to address environmental issues.

This epistemological component is treated in at least two ways: in a subject such as Science and Systems Theory or Approaches to Environmental Knowledge, and in a seminar series within the major multidisciplinary (group) project.

**Multidisciplinary projects**

Most Master level degrees in the environmental area include a research project. Several institutions require the students to undertake a multidisciplinary (group) project addressing an environmental issue for a 'client' or 'sponsor' outside the university. This results in a report similar to a consultancy report or a major multidisciplinary governmental report. In some programs, the students also complete an individual research project that may be tied to the group project. More detail on the research component is given in the parallel paper.

An important part of a multidisciplinary project is training the students in analysis of the social context and 'social construction' of the issue(s) that the project is addressing. This enables the student to understand why and how the issue has arisen, as well as understanding how the issue may be addressed. For example, a common response to the issue of the discharge of polluted water from a manufacturing process is to treat the water by an 'end-of-pipe' treatment process. A systems analysis of the issue at a slightly deeper level may try to encourage a 'cleaner production' approach to the problem. A deeper and more subtle systems analysis may ask whether we need the product at all, and seek to understand, and perhaps question, the social and economic forces driving the production process. That is, the systems approach attempts in this example to understand how the product and its production are 'socially constructed', as a prelude to addressing the issue of the discharge of the polluted water.

This second type of systems analysis is often challenging, in two distinct ways. It is often conceptually difficult and requires considerable reading and reflection for the student (and academic!) to become sufficiently familiar with it to use it as a normal part of the analysis of environmental issues. Secondly, the conclusions it generates are often challenging to the conventional understandings of appropriate action. On the other hand, the Australian experience is that seeking to understand the social and conceptual contexts of environmental issues via systems analysis often leads to increased commitment to the repair of environmental dislocations, surely one of the major aims of environmental education.
Conclusion

Environmental issues are complex. The educational response to them is therefore equally complex and diverse, particularly when the response may include involvement and action to reverse environmental degradation and decline. The character and role of undergraduate environmental education in Australia are still being clarified, with many committed and active environmentalists uncertain about the value of multidisciplinary degrees at the undergraduate level. This apparent contradiction is explained by these people's recognition that true multidisciplinary work may only be achievable when the practitioners have a solid disciplinary base on which to build at the Master's level. It is also unclear whether the epistemological complexity demanded by multidisciplinary work is appropriate at the undergraduate level. The Australian experience might suggest that it is more appropriate at the Master's level. The Mekong region faces these questions as it starts and continues the development of Tertiary level environmental education.
Part III

Specific case studies of Environmental Education in the Mekong region and Australia
ENVIRONMENTAL EDUCATION AT THE
CENTER FOR NATURAL RESOURCES AND ENVIRONMENTAL STUDIES,
VIETNAM NATIONAL UNIVERSITY, HANOI

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Introduction

Environmental education is essential to foster sound environmental behavior among all elements of society, from the youngest children to policy makers at the highest levels of government. Vietnam has already initiated a number of education and training programs related to environmental subjects. It has also made a substantial start in integrating environmental concerns in its planning through the formulation of the national environmental agencies such as: the Ministry of Science, Technology and Environment (MOSTE), Departments of Science, Technology and Environment at the provincial level (DOSTE), the National Action Plan for Environment and Sustainable Development (1991), the Environment Law (1994), and the development of environmental centers and faculties throughout the country.

In recent years, the economy of Vietnam has been growing at an impressive rate, thanks to the reform from a centrally planned to a market economy. In order to meet the need for natural resources and environmental management in a sustainable manner, the environmental training system must be further strengthened and targeted for specific intervention.

The Center for Natural Resources and Environmental Studies (CRES) of Vietnam National University, Hanoi is one of a number of centers specialized in environmental science. It was established in August 1995, resulting from a link between the Center for Natural Resources and Environmental Studies of Hanoi University (established in 1985) and the Mangrove Ecosystem Research Center of the Hanoi Teachers Training College No.1 (established in 1987). CRES is one of the first centers in Vietnam to offer postgraduate training courses.

The course on ecological approaches to land use, resources management and environmental protection

Since 1989, with the approval of the Ministry of Education and Training of Vietnam and support from international organizations such as IUCN, SIDA, IDRC and Oreverdo, CRES has offered an annual 6-month postgraduate training course on “Ecological approaches to land use, resources management and environmental protection”. The course aims to enhance participants’ environmental knowledge. It takes 27 weeks, and its teaching methods consist of in-class lectures and field work. Each year, 25 participants from various research institutes and management organizations from different parts of the country take part in the course.

In-class lectures, seminars, assignments, and field work cover the following subjects:

1. International and national conservation strategies
   - World conservation strategy
   - National conservation strategy
2. Fundamental ecology and human ecology
   - Ecosystems
   - Social systems
   - Agroecosystems

3. Land use planning and rational utilization of land resources
   - Land resources of Vietnam
   - Land degradation
   - Land use strategy

4. Wildlife resources management and conservation
   - Biodiversity
   - Management and development of species
   - International conventions

5. Forest resources management and agroforestry
   - Assessment of tropical forest resources
   - Inventory and planning of forest land use
   - Agroforestry systems

6. Management of aquatic ecosystems
   - Lake ecosystems
   - River ecosystem
   - Marine ecosystems
   - Coastal ecosystems and human impact

7. Monitoring pollution
   - Air pollution
   - Waste water and solid waste
   - Impacts of environmental pollution on human health

8. Environmental Impact Assessment (EIA)
   - Problems of EIA in developing countries and Vietnam
   - Methods, preparation and implementation of EIA
   - Applications of EIA

9. Planning, designing and implementation of environmental projects
   - Planning and project designing
   - Organizational and legal aspects
   - Economic and ecological evaluation

In order to be awarded their certificates, all participants have to pass a final exam, and successfully present and defend their final papers to demonstrate their ability to evaluate and solve environmental problems raised in the case studies in the fields in which they were involved.

Field work covers five topics, including national parks, dam-reservoir development, agroecosystems in uplands, aquatic, and wetland ecosystems.

More than 20 experienced Vietnamese scientists and 5-6 international experts are invited to give lectures and seminars every year. They are professors and lecturers of different disciplines who come from various universities and scientific research institutes.
Training of this kind is not only useful for researchers and lecturers at research institutes and universities, but also for managers at national and local levels. Nevertheless, the course requires an addition of time and an improved and broadened content on environmental economics, environmental monitoring, environmental evaluation and assessment, and environmental legislation and environmental policies.

### Course on environment management and impact assessment

In order to eliminate adverse impacts on natural resources, to enhance economic development without destroying the environment, and to have production development and natural protection co-evolve, a new scientific approach - a new important instrument for human society - has been developed. This is the approach that assesses human impact on natural resources and environment, or "Environmental Impact Assessment - EIA".

Since the 1970s, developing countries have conducted many studies, and devised laws and regulations on EIA which are seen as an indispensable part of planning and labor distribution. EIA is always required in all project proposals for development programs in Vietnam that are funded by international organizations.

EIA, nevertheless, is still a new approach, and its methodologies are constantly being updated. The appropriate application of EIA procedures in developing countries has been studied by many scientific organizations.

In 1985, the Council of Ministers of Vietnam set forth the Decree on basic investigation, rational utilization of natural resources and environmental protection. This Decree also stipulates that EIA is required in all economic and technical proposals for large construction projects and in all important socio-economic development programs. As the Prime Minister declared in the 1993 Urgent Work: "EIA is required in the proposals of all kinds of development projects, including projects with international funds".

The Environmental Law approved by the National Assembly of the Socialist Republic of Vietnam on 27 December 1993, and signed by the President on 10 January 1994, proclaims the EIA legislation and process in Vietnam.

EIA has become an essential requirement in the socio-economic development of Vietnam and has the significance of a scientific and legislative instrument to balance the development and protection of natural resources and environment. The EIA group at CRES was established 4 years ago, and a ten-month post-graduate training course on EIA was initiated in 1995. The course was funded by the International Development Research Center (IDRC) and Canada International Development (CIDA).

This course aims to provide environmentalists with knowledge of EIA so as to make better contributions to environmental management, EIA implementation, and participation in the Examination Council. The course has been organised in the form of lectures, project case work, field visits and EIA field studies. The course has been divided into two main parts, as follows.

#### Part I: Course work

1. Six courses, which focus on environmental sciences, ecology and systems analysis, environmental engineering, biodiversity, and integrated natural resource management with a scientific and discipline-oriented background (340-360 teaching hours).
2. A section dealing with EIA practice (60 hours), and

3. Analytical techniques (about 90-100 hours).

The presentation of the course topics was done by a multidisciplinary group of leading experts, practitioners, academicians and planners working from Vietnam and Canada. The greatest advantage of the courses is that it has supplied the local participants with basic environmental scientific knowledge and disciplines in conjunction with considerable valuable knowledge and experiences from Vietnam. The international experts have very strong environmental backgrounds and were very experienced in their topics, both for developed and developing countries.

The 25 participants of the class formed a very cohesive group in which everyone knew one another very well, thus making the discussion and exchange of viewpoints both comprehensive and interesting. In order to help the students to learn more comprehensively and effectively instruction frequently used the method of "brain storming". Other learning exercises, such as assignments, case studies, mini-studios or role playing exercises, were incorporated with lectures during the course. These seem to have been very useful and interesting.

Field visits and excursions were also organised to (1) Cuc Phuong National Park, (2) Xuan Thuy wetland conservation area, (3) an industrial area and (4) a sewage drainage system and a sewage-fed agriculture system in Hanoi, and (5) Lam Du landfill area of Hanoi.

After the first seven months of running the course, all lectures were completed successfully.

Part II - Practical EIA studies

To prepare for this important part of the training, a set of real projects had been selected, including: (1) An open-cast coal mining project in Quang Ninh Province (industrial project); (2) Industrial park development at Da Nang (Regional Planning Project), and (3) a recreational and tourism area planning at south Sam Son, Thanh Hoa.

List of course topics

Topic 1: Environmental management & global and national strategy on environmental protection.
   - Introduction
   - Conservation strategy
   - Environmental policies and legislation

Topic 2: Basic environmental sciences
   - Physical environmental systems
   - Ecology and human ecology

Topic 3: Environmental economics

Topic 4: Environmental management I:
   - Air pollution
   - Solid waste management
   - Hazardous waste management
   - Industrial pollution
Topic 5: Environmental management II:
- Conservation of species and habitats
- Deforestation and watershed protection
- Soil related problems
- Tropical coastal management
- Degradation, environmental pollution and outbreak of insect pests
- Cities as Ecosystems - the physical basis for urban environmental management

Topic 6: Environmental impact assessment
- General problems
- EIA process and methods
- Practical considerations in organization, process and management of EIA

Topic 7: Analytical techniques associated with EIA
- Socio-economic impact assessment and public involvement
- Remote sensing & geographic information system
- Modeling and computer application in EIA
  - Ecological modeling
  - Computer and environmental management module
- Risk assessment in EIA
  - Environmental risk assessment
  - Risk assessment and management

The course on “Sustainable Upland Management”

Another short course (three months) on sustainable upland management began in 1995. The participants of the course are those whose work relates to the mountainous areas and come from research institutes, state management agencies, and the universities. The course introduces basic concepts, such as: system theory, human ecology, traditions, customs, culture, society, economics, gender, organizations, population, and environment in the mountainous areas. The lecturers provided the class valuable lessons and experience from the mountainous areas of Thailand, Philippines, Malaysia, Indonesia, Lao PDR and Vietnam, and practical experiences from Vietnam.

The result of the course is that the participants have come into contact with, and have upgraded their level of theory and practical management of the interactions between, the components of the ecosystem and the social system of the uplands, with this understanding based within the framework of systems theory.

The UNESCO Chair in Environmental Education

The UNESCO Chair in Environmental Education established at CRES in June 1995 resulted from a joint initiative between the Vietnam National University (VNU), Hanoi, and UNESCO, with Monash University in Australia as the Chair Holder.

This present seminar is an initial activity of the UNESCO Chair in collaboration between VNU and Monash University. The purpose of this seminar is to provide participants with opportunities for environmental education experience and research exchange in both developed and developing countries, and the creation of a regional cooperative network for future actions.
Along with above mentioned, the UNESCO Chair will organize a National Seminar on Environmental Education in order to promote environmental education activities in Vietnam. The National Seminar is expected to be a foundation on which cooperation will be strengthened among national environmental training and research institutions in Vietnam.

It is expected that, with the contribution to this seminar of all present, and on the basis of current practical teaching and research experience at CRES and Monash University, a comprehensive postgraduate environmental training programme (Master of Environmental Science) will be formulated so that VNU will be able to train, to an international standard, highly qualified environmental experts for Vietnam and the Region. The proposed programme will be submitted to the Ministry of Education and Training for their consideration and approval.

Furthermore, on the basis of the training programme completed by the UNESCO Chair, CRES, in collaborating with Monash University, will establish a Master degree training programme on environmental education and management, which it is hoped will be ultimately certified by the two universities for the award of joint qualification. The proposed Master’s programme curriculum on Environmental Planning and Management is introduced by Professor Vo Quy in an accompanying paper.
MASTER OF ENVIRONMENTAL SCIENCE
ENVIRONMENTAL PLANNING AND MANAGEMENT
A DRAFT CURRICULUM FOR A NEW COURSE AT CRES

Vo Quy
Paul Bishop
Peter J. Fensham
Vu Quyet Thang

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Background

In 1989, the Centre for Natural Resources and Environmental Studies (CRES) at the University of Hanoi began the regular six-month postgraduate course on Resources and Environmental Management, and then in 1994 the one year postgraduate course on Environmental Management and Impact Assessment, to train people from different institutions of Vietnam working on environmental issues. To date, more than two hundreds people with different backgrounds have been trained and are applying their skills in different regions and sectors of the nation at state and province levels. Trainers have also found work in non-government organizations.

In the new period of development, the task of environmental protection and sustainable development in Vietnam is becoming increasingly complex and requires more efficient management of resources and environmental management. This in turn requires many qualified scientists and experts in environmental science, especially in environmental planning and management.

Goal of the course of Master of Environmental Science

The goal of the Master of Environmental Science course is to promote understanding of the interactions of ecological and social processes, leading to actions that ensure sustainable development. Therefore, the course focuses on:

- research and postgraduate course work in environmental analysis, planning and management;
- identifying the various perspectives derived from the sciences and humanities in relation to biophysical and socio-environmental processes and issues; and
- integrating these perspectives from the sciences and humanities into a multi-disciplinary framework for the development of environmental policies and management strategies, emphasis being given to key philosophical positions related to the environment and their implications for its management.

Entry to the course of Master of Environmental Science

Applicants for the Master of Environmental Science program should have a four or five year Bachelor’s degree (or equivalent) in any discipline. Graduates from all major disciplines (including the Humanities, Science, Law, Economics, etc...) are welcome as are those with extended work experience.
Aims of the course

The Master of Environmental Science program has been designed to achieve several aims:

1) To facilitate candidates broadening their experience and awareness in the areas of environmental conservation, resource management and environmental planning;

2) To provide candidates with experience in carrying out a research project on an environmental issue in a multi-disciplinary team;

3) To enable candidates to work and communicate with staff, fellow students and other colleagues in diverse disciplines;

4) To assist candidates to develop intellectual tools and approaches that are appropriate for working in the social contexts in which environment issues occur;

5) To enhance candidates' sensitivity to the complexity of environmental systems at the local, national, regional and global scales, and to develop a caring and responsible stance toward the environment; and

6) To equip graduates of the program to continue studies at a higher level within their areas of interest of environmental conservation, resource management and environmental planning.

Course details and structure

The Master of Environmental Science may be taken over two years full-time or up to four years part-time. The course involves the completion of both research and course work components.

Research components

The research component, comprising team-based (group) work and an individual research report, has the objectives of:

- training the candidate in undertaking multidisciplinary group research;
- providing the experience of doing multidisciplinary research on a real project for a sponsor or client outside CRES; and
- providing the context for the candidate to undertake an individual research project at the Master's level.

The research components are carried out in the final year but the preparation for it begins in the preceding year. In the year prior to undertaking the major research project, multidisciplinary research teams are formed to undertake the Core subject “Multidisciplinary Organisation” (MDO) which forms an important part of the ‘training’ component referred above. Aspects such as group processes, team management, Project Brief writing, project management, and report writing are given particular attention in MDO. Candidates carry out a small project, which may represent a feasibility study for their major group research project.

In their final year, candidates undertake the major research project which has two components (total of 35 Credits):
1) "Multidisciplinary Group Report" (MGR - 10 Credits). Students form themselves into teams (or groups) of up to five people. Each group develops and carries out a multidisciplinary research project for an outside client (a government department, provincial authority or private organization) which may fund the work. The project addresses a ‘real’ issue and is supervised by a committee comprising the group supervisor (form CRES), individual supervisors of each candidate’s Individual Research Paper (see below), and the client’s representative. The project culminates in the Multidisciplinary Group Report equivalent to a consultant’s report. It uses data provided by the team members’ Individual Research Papers.

2) “Individual Research Paper” (IRP - 25 Credits). The individual input to the research project is reported in the Individual Research Paper. This is supervised by the individual supervisor (a specialist academic from the research area covered by the IRP) and is written up in parallel with, or prior to the preparation of, the Group Report.

Course work components

The course work comprises four components:

- University subjects for all Master’s students;
- Foundation Studies in Environmental Science;
- Core Studies in Environmental Science; and
- Elective Studies in Environmental Science.

Each candidate selects his/her individual study program from the course work subjects. Candidates have responsibility for appraising how their particular needs can best be met by the program and should discuss their program with CRES staff before and during their candidature.

Compulsory University subjects for all Master’s students

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philosophy</td>
<td>6</td>
</tr>
<tr>
<td>Teaching Methodology</td>
<td>2</td>
</tr>
<tr>
<td>Research Methodology</td>
<td>3</td>
</tr>
<tr>
<td>Informatics</td>
<td>4</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>15</td>
</tr>
</tbody>
</table>

30

Note: A previous qualification may exempt some students from the Foreign Language requirement.

Foundation Studies

The Foundation Studies are designed:

* to introduce candidates to the key discipline ‘areas’ that are involved in environmental issues; and
* to provide a basic understanding of the fundamental principles and terminologies of these key areas so that candidates can communicate effectively with others from the various discipline areas.
The various subjects in the Foundation Studies are obligatory only where candidates have insufficient background in that discipline area. This background will be assessed with the candidate prior to enrolment. The Foundation Studies are listed overleaf.

**Foundation Studies**

- Principles of Environmental Science 2 Credits
- Ecology and Human Ecology 2
- Social Sciences and Social Sciences Techniques 2
- Introduction to Economics 2
- Introduction to Physical Sciences 2
- Introduction to Law and Public Policy 2

Maximum of 12 Credits

**Core Studies**

Core Studies relate to the primary goals of environmental planning and management. They are designed:
* to introduce all candidates to the knowledge and practice needed to assess environmental impacts;
* to equip candidates to plan developments that are environmentally sustainable; and
* to make candidates aware of environmental policies and strategies at the local and national levels in Vietnam, and at the wider regional and global levels.

Accordingly, Core Studies are compulsory for all students, and comprise:

- Global and National Viewpoints, Strategies and Policies on Environmental Protection 3 Credits
- Environmental issues in Vietnam and the Region 2
- Environmental Law & Regulation in Vietnam and the Region 2
- Environmental Management & Administration 3
- Environmental Economics and Cost-Benefit Analysis 3
- Environmental Impact Assessment 4
- Multidisciplinary Organization (MDO) 3
- Environmental Land Use and Planning 2
- Environmental Education 1

23 Credits

**Elective Studies**

The Elective Studies are designed to enable candidates either:

i) to update the expertise gained in their previous qualification;
ii) to expand on this previous expertise; and/or
iii) to develop expertise in an area in which they have no previous experience

Subjects for Elective Studies may be chosen from those listed below, from Senior Undergraduate courses in relevant disciplines, or may be offered as an approved specialised strand by other parts of VNU or other universities in Vietnam.
The number of Elective Studies subjects to be completed depends on the number of Foundation Studies subjects required to be completed. The candidate should choose electives in consultation with the staff of CRES from the list given overleaf:

**Elective Studies:**

- Environmental Management I (Industrial and Urban Pollution) 4 Credits
- Environmental Management II (Natural Resources Management) 4 -
- Modelling and Computer Application in Environmental Studies (including Remote Sensing and GIS) 4 -
- Tourism and Environment 2 -
- Soils, Land Use and the Environment etc 2 -

**Summary of Credits**

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research</td>
<td>35</td>
</tr>
<tr>
<td>Univ. Master's course</td>
<td></td>
</tr>
<tr>
<td>Foundation</td>
<td>6 to 12</td>
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<tr>
<td>Core</td>
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<tr>
<td>Electives</td>
<td>10 to 16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>102 to 110 Credits</strong></td>
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Background

Khon Kaen University is one of the main three regional universities established as part of a decentralized development plan for higher education in Thailand under the first National Development Plan. Originally known as University of the Northeast when it was founded in 1964, the name was changed to Khon Kaen University in 1966.

The establishment of Khon Kaen University was associated with the development of Northeast Thailand in conjunction with the First Development Plan, with a particular brief to promote development in the area, Thailand’s most poorly endowed in terms of natural resources. Unfortunately, since the establishment of the university, there has been continuing and severe degradation of the agricultural environment and its resource bases, namely forest, water resources and agricultural lands.

The decline of forest resources in the Northeast has been the most extreme, from 48% areal coverage of the Northeast in 1961 (before the development plans), to 14% at the end of the fifth plan in 1987. Recently, the rate of decline seems to have slowed, resulting in 12% forest cover remaining in 1994. This is probably due, in the main, to increasing awareness in the society of land degradation problems and to the implementation of measures for forest preservation. Forest degradation has also resulted in water resource degradation, in terms of both quality and quantity. The quality issues derive from soil erosion and pollution, while the quantity issues result from changes in watershed structure as a result of forest degradation. The degradation of the productive capacity of agricultural land is primarily the outcome of declining soil fertility. The soils of the region are sandy and of low nutrient status with limited potential for ongoing nutrient replenishment.

Throughout the operation of the Development Plans, there has been severe neglect of this poorly buffered environment with its poor endowment of resources. Such neglect is also due to poorly planned agricultural development which has caused inappropriate land use and rural resource degradation. Promotion of upland crop cultivation was a major theme of development until a strong feedback on the degradation was signalled by out-migration of Northeast people to various parts of Thailand. Since then, more serious attention has been paid to the appropriate development of the Northeast.

In addition, most of the planning processes have been largely biased to urban development, with poorly planned town and community growth, together with relatively ineffective control of industrial zones and environmental management. The problem has been worsened by weak land use planning policy together with a lag in appropriate legislation on most of the issues. The combination of these factors has meant that different environmental issues have become major problems in every part of Thailand.
Direction of the problem

Currently, industrialization is a drive for the highest output production system. This philosophy is widespread, extending to agricultural sectors, including even the poor agricultural resource of Northeast Thailand. Misuse of natural resources and agricultural lands generally results from this drive to the highest output system. Development can cause severe loss of the agricultural resource base and usually results in uncontrolled pollution. Under this prevailing atmosphere of industrialization, there is also a high tendency to misuse land and water resources for superficial, short-term economic return, such as for commercial recreation areas, real estate, and speculative suburban development.

Such an atmosphere of industrialization can also result in pressures on city waste disposal and sewage treatment. Problems related to high population density, such as housing, domestic wastes, traffic, and air pollution, are also increasing in Northeast Thailand, and industrial waste and pollution are also often not under effective control.

Principle, concept and approaches at Khon Kaen University

As stated previously, Khon Kaen University (KKU) has been assigned to assist in the regional development of the Northeast. Initially, the university followed a primary approach based on the direct introduction of modern technologies from developed countries, especially in cultivation practices and other related technologies. Unfortunately, this approach was followed for nearly 10 years without success. After these years of failure, the majority of the staff of the KKU Faculty of Agriculture realised that a major mistake had been made. Since then, KKU staff, especially those from the Farming System Research Group, have attempted to understand why this approach was unsuccessful and have concluded that it should adopt systems approaches and the development of systematic inputs.

This approach has gradually evolved from one of ‘learning from our mistakes’, to approaches based on farming systems, the agro-ecosystem, human ecology and rural resource systems analysis. Contributions have also been made through the Southeast Asian Universities Agrosystem Network (SUAN). Many conceptual tools have been developed to understand the dynamic phenomenon of the agricultural system of subsistence farmers. The conceptual tools that we have developed so far include: the family tree; the kinship diagram; land use maps; land use calendars; labor calendars; activity calendars; processes, resource and energy flows; decision trees; and logical trees. Regional problem identification requires agro-ecosystem analysis, and pre-existing data analysis using data overlaying techniques. The analysis identifies the existing situation according to zones, with potential problems also identified as zones. After verification of the zones through field surveys, zones can be selected for further study and planning.

This type of study normally also includes problem type grouping and further verification techniques. The most crucial point of the approaches are local people’s participation in the analysis because this can reveal their priorities and constraints, as well as existing solutions and remaining problems. Verification should also carried out on the potential solution and the local people’s response, with any modification. At the village or small community level, problem identification is carried out primarily through semi-structured interviewing which begins with those who best know the existing situation - the so-called key informants. With further verification from other available members, this yields valid primary information for the planning process at the local level. Larger scale or higher level planning is then undertaken through a hierarchical analysis of the problem incorporating local people’s suggestions.
Most of the information is collected by this semi-structured interviewing technique, through objective settings, preparation of conceptual tools, and analysis. Similarly, at the lower levels of the hierarchy (at household level), problem identification and verification can use the same procedures but at a different level of detail.

For analysing problems into categories and types, the issues are monitored for problem validation, problem organization, local and central prioritization, alternatives, opportunities, limiting factor identification, suggested solution(s) and local people’s responses. Thereafter, for research proposal preparation, the necessary steps are problem type identification, prioritization and selection, relevant problem identification, justification, workplan setting, implementation plan, monitoring and evaluation plans.

On the stage of appropriate technology generation, a major critical consideration is the depth of technical knowledge, identification of the problem type, prioritization and selection, justification, workplan, site characterization, design and management, sampling, analysis and interpretation.

For the stage of implementative research, steps include site characterization (land type, farmer type, crop type, etc.), comparable plot layout and suitable design, statistical and replication procedure, degree of similarity, farmer selection, measurable parameter, and cause and effect analysis. Primary research monitoring includes processes, plan analysis, relative progress assessment, indicators, follow-up procedures and fine tuning. The mid-term and final evaluations include processes, direction and progress, local people satisfaction, goal and impact assessment, effectiveness of technology as assessed by agronomics, economics, cultural and social parameters, and cause and effect analysis.

As described above, a systems approaches for problem analysis could be analysed through resource system analysis and livelihood system analysis. In most cases, realistic curricula for both technical and social applications are developed simultaneously thorough interactive planning and monitoring.

The state of development of Environmental Education at KKU

The concept of systems analysis for the solution of actual environmental problems is rather recent. It is quite normal that such a concept change for a whole institute is a very major task. The scale of the task also reflects the fact that the approach incorporates unconventional thinking processes. However, we hope that the development of realistic and practicable procedures can soon be generally realised. Hence, manpower development for an ideology committed to linkages between local and macro problem orientations must be developed. In order to achieve this target, one short-term approach is curriculum development that allows for more realistic and greater interaction between students and lecturers, as well as between students themselves. It is a fact, however, that the program has to be developed gradually to allow maximum participation of most members. One of the most important techniques is to let everyone participate throughout problem analysis (i.e., from beginning to end).

Course development at Khon Kaen University

The required knowledge has been introduced primarily into undergraduate courses, as an introduction to agricultural system, through linkages of subjects in the curriculum and by the faculty academic structure. Since initiation of Farming System Research Project at KKU in 1982, agricultural resource systems and farming systems have been carefully studied in terms of their interactive components. Thereafter, rural resource systems are studied as a means of understanding
the overall processes of farmer livelihood. The findings lead the curriculum development processes initially into further systems-oriented approaches for agricultural environment, and later on for agricultural resources and the environment in the various faculties of KKU. However, the most significant changes have been in the Faculty of Agriculture, KKU, as well as in other Thai partner universities, including Chiang Mai University, Kasetsart University and Prince of Songkhla University. There were changes in both the structure and principles of courses, and these are continuing. Currently, for undergraduates of the Faculty of Agriculture at KKU, there are courses such as Agricultural Systems, Farming Systems, Management of Nature for Agricultural Development and related practical courses.

At the postgraduate level at the KKU Faculty of Agriculture, the following courses are available: Cropping and Farming System Analysis, Soil Management and Land Use Planning, Land Evaluation, Soil Environment, Agroecosystem, Analytical Methods for Agricultural Resources and Environmental Quality, Control of Environmental Pollution for Agricultural Development, Watershed Management, Agroforestry, Management of Natural Resources and Environment, Population Resource and Environment, and related topics.

Other faculties have also made quite extensive internal linkages with the teaching concepts in the Farming System Research Project at KKU. The network includes the Faculty of Humanities and Social Sciences, the Faculty of Medical Sciences, and the Faculty of Management Sciences. The Faculty of Humanities and Social Sciences has developed a Master's Degree in Development Sociology focusing on natural resources and environment development. The Faculty of Management Sciences has also set up courses to promote maintenance of environmental quality pertaining to the lessening of out-migration of people from the Northeast, and the Faculty of Science has diverted resources to support teaching and research in Environmental and Natural Resource Management. The Faculty of Engineering, with the Department of Environmental Engineering, teaches and has various research projects on pollution monitoring and control.

Furthermore, there is also joint teaching of the Master of Rural Development Management Program, by staff from the Faculties of Agriculture, Humanities and Social Sciences, and Management Sciences, and from the Research and Development Institute (RDI).

The main underlying principles in these various courses are the systems approaches, system characterization, linkage of micro-level and macro-level through flow, space, time and decision on pattern analysis for material and energy. These common underlying principles have proven effective for universal applications.

**Constraints, opportunities and potentials of Environmental Education development**

**Constraints**

Despite the relatively successful development of these various courses, the concept is still not completely clear to all relevant staff. Hence, it is subjected to a range of interpretations. The process is therefore both problematic and of great potential in the real working environment. Limitations may also be related to the slowness of the development of the approach. Due to its broad base nature, it is also limited by the staffing requirements for each new direction. In its favour, it can develop a diverse and broad knowledge to ensure a firm and sustainable internal structure.
Opportunities

Since the number of staff on each section of the program is small, it can be easier to change direction to a more appropriate concept and a clearer understanding of an actual phenomenon. Most of all, the staff of the program strongly believe that sooner or later, society needs to sort out proper methods from the confusion of unplanned development in the country; this is probably also needed at the global scale. Until that time, system analysis for various problem identification is definitely needed.

Potentials

The Farming System Research Group at KKU and similar groups at other Thai Universities could act as a main core team for concept development and distribution of the knowledge for appropriate environmental management from various entry points. Dissemination procedures could draw on diverse contacts with other sectors through meetings, training, and planning processes. Currently, there are more than 10 international and national training courses at KKU annually. Most of these are directly related to the systems approach and analysis developed at KKU by the Farming System Research Group.
ENVIRONMENTAL EDUCATION IN VIENTIANE FORESTRY COLLEGE

Bounmy Phonesavanh
Vientiane Forestry College
Lao PDR

General information

The Vientiane Forestry College (VFC) was established by the Ministry of Agriculture and Forestry in 1985. Its history, however, goes back to 1970 when it was founded under support from Australia as the first Forestry Training Centre in the country, training students in short courses. Later, in 1979, it was upgraded to a Forestry Technician School and the curriculum was improved and extended to a two year course. Until 1989, it was supported by the former GDR and SIDA. At the present time, the college is supported by the Federal Republic of Germany "Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)".

The main objectives of establishing the forestry college have been:

i. to provide graduates with the knowledge, skills and attitudes which they need to manage the forest resources of Lao PDR successfully, and
ii. to provide an internationally-recognised basis in forestry education sufficient to allow graduates to continue their studies in Master and Doctoral degree programs in other countries.

Environmental Education

In striving for socio-economic development and improved living conditions for all, Lao PDR faces many complex land-use issues. Graduates of the VFC need to have the knowledge, skills and attitudes for working in the government and in the private sectors to address these issues and to promote sustainable natural resource management.

The following subjects are taught in the VFC; the highlighted subjects are directly related to environmental education.


Teaching /learning approach.

In the first two year of the program, the emphasis is on the acquisition of a sound basic knowledge in key disciplines and essential skills. In the third and fourth years, an inter-disciplinary approach to issues in forestry and land-use management in Lao PDR is employed. Where possible, a problem-
based, experiential approach is utilised. Up to 30% of the time scheduled each term is spent in the field, and extensive practical work is undertaken for five term breaks at VFC's training forest site (a total of 28 weeks over four years).

**Environmental education experiments and consultancy**

Environmental studies mostly emphasise natural forest resources management. Final year students must undertake research in different forestry sectors and provinces.

Teachers teach not only in the college but in other institutes as invited guests, and some teachers also work as temporary consultants.

Many organisations contact the college for information and consultancy.

The college laboratory plays an important role in chemical analysis and provides significant data for natural resources management.

**Employment of Graduates**

Graduates work as government forestry advisors, watershed managers, land use planners, integrated land use managers, and as teachers and trainers.

**Obstacles**

The college has only limited qualified teachers/staff; only two could be said to be qualified as environmentalists. The staff's knowledge of teaching and content influences the quality of the college's graduates. The VFC facilities are not as good as they should be, and, at present, the network of support of staff is too small. It is hoped that the UNESCO Chair at CRES will help to extend this network.
ENVIRONMENTAL TRAINING AT THE TERTIARY LEVEL IN MYANMAR

Hla Phone Aung
University of Yangon
Myanmar

Introduction

Environmental education at all levels, particularly at the Tertiary level, is most important for raising the environmental capacity of a nation. This objective is also accepted in Myanmar. Since 1985, environmental research has been carried out at the Analytical Chemistry Research Laboratory (ACRL) of the Department of Chemistry, University of Yangon, under the supervision of Drs Aung Myint and Oo Aung. Environmental training courses are given at the First Year Honours (Chemistry) level at the University of Yangon. The methods and techniques of Environmental Chemistry Analysis are taught at the Master’s degree level for Analytical Chemistry specialization students at the University of Yangon.

Now in other Universities, namely, Dagon University, Pathein Degree College, and Magway University, environmental education and training can be undertaken. Occasionally, short courses in environmental education (water, air, and soil pollution problems) are given at Departments under other Ministries.

Environmental Chemistry Education Courses in Universities

At the University of Yangon, First Year Honours Chemistry students are engaged in the following environmental chemistry practical experiments:

(a) Determination of total hardness in water samples.
(b) Determination of total alkalinity in water samples.
(c) Determination of dissolved oxygen (D.O.), biochemical oxygen demand (B.O.D.), and chemical oxygen demand (C.O.D.) in water samples.
(d) Determination of salinity in water samples.

Reference books include:


Second year Honours (Chemistry) students study the following environmental chemistry topics.

i) Acid - Base equilibria, represented by logarithmic diagram.
ii) What is Environmental Chemistry?
iv) Redox Equilibria in Natural Waters.
v) Complexation in Natural Waters and Wastewaters.
vii) Chlorofluorocarbon (CFCs) and theory of the Ozone hole.
viii) Population, Production, and Pollution.
ix) Temperature Inversion, and the Greenhouse Effect.
x) How to save your Environment?

Reference literature includes:


Master’s degree (two years) students in Environmental Chemistry study the following environmental topics:

i) The environment and the nature of pollution
ii) Water pollution and trace-level substances in water
iii) Water treatment
iv) Environmental chemical analysis
v) Environmental biological analysis
vi) Advanced analytical methods
vii) Environmental biochemistry and chemical toxicology
viii) Soil pollution
ix) Environmental management systems

Literature references used for environmental topics are international Chemistry journals and magazines, especially the *Chemistry in Australia* and *Chemistry in Britain* magazines.

Some environmental research projects in Myanmar universities

Since 1985, Environmental Research Projects have been successfully undertaken at the ACRL at the University of Yangon. Many water pollution problems were solved at the ACRL. The following Environmental Research Projects have been completed.

**Analytical studies of water environment of hmyin (*Acetes and Mysid*) (1986)**

Studies on the environmental water quality of the Kadonkani region of Ayeyarwady Delta were undertaken. Hmyin is the raw material for making *hmyin ngapi* and *ngan-pya-yay* (shrimp paste and sauce), which are important traditional foods for Southeast Asians, as well as for the people of Myanmar, supplies of Hmyin have been declining since 1985. Water, hmyin and plankton samples collected during the hmyin catching period (from December to March) were analysed for a range of parameters.

The physicochemical properties studied for the water samples were temperature, pH, dissolved oxygen (D.O.) content, salinity, chloride, total alkalinity, total hardness, biochemical oxygen demand (B.O.D.), chemical oxygen demand (C.O.D.), ammonia nitrogen, nitrogen as nitrate, nitrogen as nitrite, orthophosphate, sulphate, and trace elements (Na, K, Ca, Mg, Fe, Cu, Zn, and Pb).

It was found that the raw materials being used for making hmyin ngapi and ngan-pya-yay at the present time is *Acetes spp.* (hmyin) and not shrimp larvae. This research has also shown, at a
preliminary level, that the production of hmyin *ngapi* and *ngan-pya-yay* has decreased due to the small size of catches in the hmyin catching area.

**Environmental studies on Bago River water near a prawn hatchery (Tharkayta) (1991).**

The quality of Bago River water pumped into the hatchery’s reservoir was studied every two months, to assess whether the physico-chemical properties of the water could be used to elucidate the high death toll of prawn larvae. Also, the absorption behaviour of *Chlorella spp.*, the predominant species found in green water, was used as a bio-indicator to study the effects in the chemical pollutants such as ammonia nitrogen, orthophosphate and zinc which were detected in amounts much exceeding the allowed limits. It is hoped that this study will be of benefit to the prawn hatcheries in the removal of both the chemical and biological pollutants effectively in the near future so as to boost the survival rates to normal range.

**Environmental studies on watercress in Yangon (1995)**

Watercress, one of the most popular vegetable dishes at the Myanmar dining table, was studied from chemical and microbiological stand-points. The water environment where these watercress is grown was also investigated. The investigation of the watercress involved determination of the contents of food values, viz., ash, mineral elements, heat of combustion (energy content), and protein. The water quality investigation analysed the watercress’s bacterial counts. It was shown that successful removal of contaminants from the watercress samples can be achieved by dipping in boiling water for 1 minute which is in preferable to washing the cress five times with tap water.

**Environmental studies on fresh water of the Yangon area (South Okkalapa)**

The main aim of this study was to assess whether the water consumed by the local public is fit for human consumption as regards trace elements (inorganic pollutants including toxicants such as zinc, copper, and lead), physicochemical properties, and bacteria. Most of the water samples obtained during the rainy season (June and August) contained relatively high counts of coliforms and *E.coli*; these may be minimized by boiling the water for at least 20 minutes.

Except for high bacterial counts, the quality of water samples was satisfactory for domestic as well as drinking purposes. If the quality of water become more polluted, it is unfit for drinking. It is better to control and prevent it as early as possible. The principal purpose of water purification is the protection of the public health through the prevention of water-borne diseases.

The surroundings of wells should be free from potential danger. Sewers may break and allow sewage to seep into the well. Abandoned wells should be plugged with concrete.

Owners of the wells are satisfied with the knowledge of the acceptability of the drinking water in their wells. They were also very glad to learn how to improve their tube wells to obtain good domestic water. There were no traces of Zn, Cu, and Pb in any samples. So it was free from poisonous substances and cannot cause diseases.

It is hoped that this work will be of benefit in the environmental studies of water in the suburban areas. It will be an indication whether the local water used by the public is free from pollution or not.
Conclusion

Environmental education at the tertiary level is being carried out successfully in Myanmar. Next year, in Teachers’ Training Colleges and Institute of Education, environmental education courses will be introduced. Efforts are being made to introduce education at all levels more widely. It is hoped that environmental education knowledge will be spread to the public. Research projects for water, air, and soil pollution problems will be studied at the universities. Also pollution control and treatment can be undertaken in Myanmar. Some of our environmental research papers are published in the Journal of Myanmar Chemical Society (J.Myan.Chem.Soc.).

Acknowledgements

The author wishes to express his deepest gratitude to UNESCO and Monash University (Australia) for sponsoring his participation in the “Regional Seminar on Environmental Education at the Tertiary Level”, in Hanoi, held during 18-21 March 1996. I am also grateful to the Ministry of Education and the Department of Higher Education for giving me the opportunity to attend this seminar and present this paper. Last, but not least, I am indebted to Professor Nyunt Wynn, Dr Aung Myint, and Dr Oo Aung for their kind encouragement and guidance in many respects.
ENVIRONMENTAL CONCERNS IN THE PROCESS OF CONSTRUCTION

Shi Weilin
Yunnan Polytechnic University
China

Environmental problems are of concern everywhere and impinge on all citizens. The areas of forests in all countries are declining. Rivers are polluted by waste water from factories. The land surrounding our houses is increasingly polluted. Many places are becoming an environmentalist's nightmare. We now realise that the Earth is a place with an intricate relationship between human beings and nature. It is a very complex system. If we break the balance of the system, later generations will suffer. To maintain the balance, many types of professionals are needed who are sensitive and equipped to act in environmentally sound ways. This paper is concerned with architects as one group of these professionals.

We all need adequate shelter. As the population increases, we have to construct more new buildings and to increase other forms of production. Accordingly, the ancient traditional towns are fading away little by little. Streets are widened and more roads paved. We cannot go back to the ancient ways. Nevertheless we have to protect the environment in these processes, and this needs action in two ways. The first is creating and keeping environmental consciousness in mind while we construct the city, so that in all our actions we do our best to reduce the damage to nature. The second is to educate students who will be able, and have the duty, to protect the environment in the future.

The first way includes four aspects: saving land, saving energy, protecting the vegetation, and protecting the cultural environment. Current practice, whenever we are making a plan for the city or undertaking a construction project, is to pay a lot of attention to how land can be saved, how energy use can be minimised, and how vegetation can be preserved or replaced. In addition, we actively set out to protect the cultural environment.

To save the land, dwellings are multi-floored apartments in China, and all city buildings are multi-floored or high rise. Rules to control the density of buildings are issued by the administrative department, and the density of population in living areas is likewise controlled. Nobody can waste land freely. There are also regulations that require developers to keep some land for garden and trees so that not all the land is covered by construction.

Saving energy is another important way to preserve the environment since, in the processes of making and using energy, so much wastage is occurring. In Kunming City, it is now popular to make use of solar energy to heat water for daily use in the house. It is not a complex technology, but a lot of energy can be saved. The method is to put plates on the top of the building to collect the sunlight which is then transformed into heat energy and transferred to water thus raising its temperature. This simple system works very well on any sunny day. Vegetation in the city is also an effective way of keeping our living areas in good condition. Plants can keep our air clear. Living only between bricks and cement is not healthy for our bodies. But we cannot afford to have a lot of land for trees because the price of land in the city is so high. Accordingly, when we clear out trees for construction, we need to replant as many as possible, using the roof of the building for plants and the belt between the walkway and the vehicle way for trees. In these ways the green is kept in the city.

The cultural environment is also of great concern to us. This is not simply a scientific or technical matter, but also one that involves the humanities. From the 1980s we have had projects that are researching the culture of human living places. The countryside, small towns and the houses of minority groups have been the foci of these studies. Our purpose here is to be able to preserve the natural environment and its
historical context. Many different teachers have taken part in these projects and excellent results have been obtained. The topics of these research studies have covered city planning, city preservation planning, building design, and the documentation of minority groups' villages and dwellings.

The second way is to design a good teaching program for the architecture students who will take up positions that will influence the future of our living spaces. They will do the design for housing, as well as undertaking the planning of housing construction business enterprises. Some will go into associated administrative departments. Some, after graduation, will be in charge of executive departments for environmental construction. It is, thus, very important to give these students the right knowledge and skills, as well as the ideas of how to preserve our environment while they are undertaking construction activities. We let the students join in their teachers' research projects and support their participation with lectures on cultural history that are in addition to their required courses.

The required courses are aimed at training the students to make plans in an effective way. We have courses on Regional Planning and on Environmental Design. In the courses on Architectural Design, Scene Planning, and Regional Planning, we focus on how to be concerned with the natural conditions, such as the water sources and outlets, the land characteristics, the trees, and the weather directions. The purpose of Scene Planning is how to make use of the natural land as park but without damaging nature. The purposes of Environmental Design and Architectural Design are to create good man-made environments and buildings in the process of constructing the city. Each of these courses is full of environmental consciousness.

We also offer lectures about the history of minorities. The tourist business is active in Yunnan Province, in part because of the many minority groups who live in the province. Tourists like to visit their small towns and villages, so it would be a major mistake not to maintain the social features and attractive environments of these places. Our students, accordingly, learn the history of Yunnan minorities’ architecture and study their houses and towns. The students are then encouraged to use this knowledge in their design work so that it has the effect of maintaining these special local features.

The students' involvement in their teachers' projects gives their work a sense of reality and is an effective way of giving them the opportunity gaining and working with the complexity of the environmental concept. Especially for the graduate students we often let them do some real planning or research so that they will be better qualified for their future jobs.

By doing our best to do relevant research and by teaching ordinary students to be cultured persons, we will have many people who can work comfortably on the scientific and humanistic aspects of the environment. Only in this way can we contribute to keeping our Earth clean and safe.
THE MONASH UNIVERSITY EXPERIENCE OF PREPARING MASTER'S STUDENTS FOR MULTIDISCIPLINARY TEAM-BASED (GROUP) RESEARCH

Paul Bishop
Monash University
Australia

Introduction

In my discussion earlier in this volume of Australian environmental degrees, I highlighted the importance of multidisciplinary group research work in many Master's level programs in environmental science. In this paper, I present the philosophy, structure and operation of the Monash University Master of Environmental Science program in the Graduate School of Environmental Science (GSES). I concentrate on the core Monash course, Multidisciplinary Organisation, in which students are introduced to the undertaking of multidisciplinary research. Students undertake this course in the year preceding their major group project and their individual research paper (i.e., in the first year of full-time candidature and the second-last year of part-time enrolment). It is therefore the key course that they undertake to prepare themselves for their major project.

The multidisciplinary approach is at the heart of addressing environmental issues. It is critical, therefore, that teams operate effectively: the team’s ability to operate as a cohesive multidisciplinary team is in fact a measure of its potential success in addressing environmental issues. Likewise, the teaching of the course requires a team approach and so a team of three academic staff from different disciplinary backgrounds in GSES (Sociology, Medical Science, Earth Science) is currently responsible for the course. The staff themselves rely on a shared, team-based evaluation of the various pieces of assessment required in this course.

As a final introductory remark, it must always be remembered that the “technical fix” is but one approach to addressing environmental issues. All multidisciplinary projects undertaken by Monash GSES students must, therefore, include both technical (“scientific”) and social components. Inclusion of the social component acknowledges that environmental issues have, by definition, a human dimension which must be addressed if sustainable solutions to these issues are to be found. It also acknowledges that the technical fix is often (some would say always) insufficient on its own, and that appropriate solutions may lie outside the technical domain. In other words, actions and initiatives to repair environmental dislocation may most appropriately be located at the local community level. This is very clearly the case in some of the issues of regional development and resource utilisation and allocation currently faced by the Mekong region.

A sensitivity to the social dimension, both in the issues being treated and the ways in which they are addressed by the research team, is central to the Monash approach to multidisciplinary research. The latter means that the team must be conscious of its own processes and manage the project within the context of the team’s skills, strengths and weaknesses, as well as within the context of the issue being addressed. To that end, half of the assessment of MDO is based on the final report (the ‘product’) and half is based on team management and project organisation (the ‘process’).

The Monash M.Env.Sc. course

The Monash M.Env.Sc. program consists of four elements: Foundation Studies (~10% of the course load), Core Studies (~25%), Elective Studies (~15%) and Research Projects (~50%). The
Foundation Studies provide introductions to five key disciplines in the environmental area for those without prior experience of some or all of them (Social Science, Physical Science, Economics, Law and Ecology). The Electives provide the students with enhanced skills in areas outside their own disciplines or an updated (re-)training in these disciplines, and the Research Projects comprise a major (one-year) Multidisciplinary Group Project with a parallel Individual Research Paper. The Core exposes students to science and systems theory (the 'epistemological' component that I commented on in my paper on undergraduate and postgraduate environmental programs in Australia), and a ‘training’ course in the organisation and management of multidisciplinary projects, Multidisciplinary Organisation.

**Multidisciplinary Organisation**

**Aim of the course**

The aim of the course, Multidisciplinary Organisation (MDO), is to prepare candidates for their final, Multidisciplinary Group Project (MGP) by providing relevant guidelines, techniques and working experiences in the multidisciplinary organisation of interdisciplinary environmental research. Participants have the opportunity to gain a broad appreciation of the methods and dynamics of interdisciplinary research, as well as exploring research topics relevant to their final MGPs. The core of MDO is an intensive (19 week) investigation by self-selected groups of a chosen topic, culminating in the scheduled preparation of a group report.

Since the skills which MDO aims to develop are essentially dependent upon practical experience and practical tasks (unlike perhaps the skills required to prepare a literature-based review of a discipline area), teaching in MDO is restricted to the presentation of general guidelines and strategies, together with constructive criticism of the various submissions required throughout the course. The process of learning the skills of interdisciplinary research and professional investigation involves an element of trial-and-error together with personal reflection.

The elements stressed in MDO are:

i. **Research design** - formulation of clear research aims of objectives grounded within a conceptual framework, a planned schedule and a sound methodological strategy;

ii. **Project organisation** - adaptation and integration of research design within the practical constraints affecting research project performance (e.g., available resources and skills, information constraints, analytical difficulties, client expectations, time scheduling);

iii. **Group dynamics** - monitoring and analysis of the impact of personal responses and social interactions experienced during the research process, in relation to research design, organisation and output; and

iv. **Report writing** - approaches to the writing of professional (and academic) research reports, in relation to research design and organisation, and culminating in the production of a well-written interdisciplinary report.

**Organisation of the course**

The course comprises four main groups of activities:

i. formation of teams to investigate selected topics;
ii. a series of lectures presenting guidelines for interdisciplinary research, project organisation, group dynamics and report writing;

iii. progressive student submissions and staff consultations culminating in a project report; and

iv. group dynamics reports and evaluation of team and individual experiences.

The timetable is given below.

**Group and topic choice**

The formation of both topic and group most satisfactorily occur together - such “organically grown” combinations are beneficial to the successful completion of a project. Projects based on complementary combinations of research interests and skills are the easiest and most pleasant to conduct and are therefore encouraged in MDO.

Project groups consist of a minimum of 3 and a maximum of 5 members, preferably representing different disciplines or professional skills. However, group members do not need to work within the background of their previous disciplinary backgrounds. Topics must not be restricted to a wholly technical issue, and must include a social element. At Monash, we also find that it is preferable (from the point of view of stimulating productive interaction) to have a mix within each group of part-time and full-time students, and different genders and age groups. It is not acceptable for any group to have more than two thirds of its members from the same discipline nor for such a group to do a project within the discipline area of this majority of its students (eg., it is not permitted for a group of five with three teachers to do a project on education).

The project topic should preferably be related to a real and topical social/environmental issue and thus respond directly to an actual need for social/environmental research. The study might be a feasibility investigation for the final Major Group Project although this is by no means obligatory.

**Assessment**

The assessment for the course is related to groups, not to individuals and so each individual is awarded his or her group rating. MDO is assessed using a range of criteria related to:

- **Final Group Report**: clarity and coherence of presentation, effectiveness of interdisciplinary integration, evidence of adequate contribution of all group members, and achievement of stated aims and objectives; note that no original research or laboratory work is required, but the quality of the data that are used and the validity of any assumptions must be established.

- **Performance during the Course**: presentation on time of all required submissions.

- **Team Dynamics and Management**: two reports are required: Group Dynamics Progress Report and a Final Group Dynamics Report. The assessment emphasises a group’s awareness and analysis of its own dynamics and its “real life” performance in carrying out the project. In particular, the group should focus on the positive and negative lessons they learned about team management and functioning during the course of their MDO project, to carry these forward to the major project and then into their subsequent careers.
It is important to be aware that an MDO student group has no clear authority structure, unlike a government department or a private company undertaking environmental research or impact assessment. This means that the staff have to be particularly sensitive to issues of team management and group process. This is why it was noted above that complementary combinations of research interests and skills are the easiest and most pleasant to conduct, and that the students should be encouraged to seek out these combinations when the groups are forming.

- **Reviews**: Each team is to submit at the appropriate interviews written **critical reviews** of the Project Brief, Progress Reports and Final Report.

Normally, all students in an MDO team receive the same final assessment grade but it is possible for an individual to receive a final grade different from that of the other members of his/her team. This can arise if team members (who, it must be remembered, are responsible for all aspects of team management and functioning) approach the MDO staff to make a case for differentiation on the basis that the student concerned has not contributed sufficiently to the MDO process and/or the final report. Such differentiation is not automatic, however, and is indeed a relatively rare occurrence. This is because inequality of input among group members may indicate poor management of the team and/or project, in which case the assessment of the whole team should perhaps be adjusted downwards.

The (major) Multidisciplinary Group Project and the Individual Research Paper

I say relatively little about these here because they are based on an elaboration of the principles on which MDO is based, with the added element of an Individual Research Paper. The structuring of the Major Group Project is also a little more complicated than for MDO, because the Group and Individual projects are run in parallel. The timetable for this is also given below.

In the final year of candidature, groups develop and carry out a multidisciplinary research project for an outside client (a government department or private organization) which may fund the work. The project addresses a ‘real’ issue with technical and social elements, and is supervised by a committee comprising the **group supervisor** (from GSES), **individual supervisors** of each candidate’s Individual Research Paper (from all Faculties in the wider Monash University), and the **client’s representative**. The project culminates in the Major Group Report equivalent to a multidisciplinary consultant’s report. It uses data provided by the team members’ Individual Research Papers.

The individual input to the research project is reported in the Individual Research Paper. This is a traditional piece of academic research generally in a single discipline area, and formerly in the Monash system was a Minor Thesis. After a recent restructuring of the Monash program, the individual research work is presented in a form that can be submitted, after assessment, to a journal for possible publication. It is supervised by the individual supervisor (a specialist academic from the research area covered by the IRP) and is written up in parallel with the preparation of the Group Report. It provides the data necessary for the completion of the Group Report which is not therefore centrally concerned with the quality of the data and its assumptions, but with the interdisciplinary linkages between the various elements of the issue and its resolution. The Group report must be based on sound data, nonetheless, especially as many of our projects are on sensitive and contentious issues. The research for the Individual Research Paper and its supervision by an academic in the appropriate field gives us that confidence in the results that are to be included in the Group Report.
### MDO Timetable and Assessment

<table>
<thead>
<tr>
<th>WEEK</th>
<th>CLASS ACTIVITY</th>
<th>SUBMISSIONS</th>
<th>ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course introduction; select group projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Research Design &amp; Project Brief</td>
<td>Critique a past report</td>
<td>P/F</td>
</tr>
<tr>
<td>3</td>
<td>Project Planning &amp; Management</td>
<td>Finalize teams &amp; projects</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Team Structure &amp; Dynamics</td>
<td>Project description; form support pairs</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lateral Thinking</td>
<td>Project Brief; minutes of meetings</td>
<td>10%</td>
</tr>
<tr>
<td>6</td>
<td>Staff/team Interviews to review Brief</td>
<td>Brief critique</td>
<td>P/F</td>
</tr>
<tr>
<td>7</td>
<td>Report Writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Team/Staff Consultations</td>
<td>Meetings minutes</td>
<td>P/F</td>
</tr>
<tr>
<td>9</td>
<td>No class</td>
<td>Prelim. Project Report</td>
<td>12%</td>
</tr>
<tr>
<td>10</td>
<td>Team Conflict Management</td>
<td>Prelim Group Dynamics Report</td>
<td>6%</td>
</tr>
<tr>
<td>11</td>
<td>Guidelines for team management. Team progress review &amp; staff feedback (interviews).</td>
<td>Critique of Preliminary Report</td>
<td>P/F</td>
</tr>
<tr>
<td>12</td>
<td>Institutions, Clients &amp; Consulting</td>
<td>Final report Format; Meeting minutes</td>
<td>P/F</td>
</tr>
<tr>
<td>13</td>
<td>Team/Staff Consultations</td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td>No class</td>
<td>Final Project Report</td>
<td>50%</td>
</tr>
<tr>
<td>15</td>
<td>No class</td>
<td>Final Group Dynamics Report</td>
<td>12%</td>
</tr>
<tr>
<td>16</td>
<td>No class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>End course team interview &amp; staff assessment</td>
<td>Critique of Final Report; Individ. Review Report</td>
<td>P/F</td>
</tr>
<tr>
<td>18</td>
<td>Debriefing in class; MDO personal interviews</td>
<td></td>
<td></td>
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<tr>
<td>19</td>
<td>No class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>No class</td>
<td>Course Questionnaire</td>
<td></td>
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</tbody>
</table>

Note that a further 10% is awarded by the academic staff based on an overall assessment of each individual’s performance throughout the course.
The following timetable for the final group and individual projects in 1996 is included to give a sense of how these two components are administered at Monash. It should be noted that four meetings were held before Christmas in 1995 to define projects and form groups.

<table>
<thead>
<tr>
<th>Date</th>
<th>Major Group Project</th>
<th>Individual Research Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 30</td>
<td>Workshop on Brief (Content &amp; Presentation)</td>
<td></td>
</tr>
<tr>
<td>February 6</td>
<td>Team Research Methods Workshop</td>
<td></td>
</tr>
<tr>
<td>February 13</td>
<td>Brief presentation (4%)</td>
<td></td>
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<tr>
<td>February 19</td>
<td>Submit written Brief (8%)</td>
<td></td>
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<tr>
<td>February 20</td>
<td>Workshop on topic development (the 'issue' or 'question')</td>
<td></td>
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<tr>
<td>March 5</td>
<td>Research topic presentation; submit research project outline</td>
<td></td>
</tr>
<tr>
<td>March 12</td>
<td>Workshop on research literature review</td>
<td></td>
</tr>
<tr>
<td>July 2</td>
<td>Workshop on research paper writing</td>
<td></td>
</tr>
<tr>
<td>July 22</td>
<td>Submit Draft Research Paper (6-10,000 words; P/F - if Fail must resubmit and Pass before final individ. report can be submitted)</td>
<td></td>
</tr>
<tr>
<td>July 29</td>
<td>Submit Group Proj. Progress Report, including Table of Contents</td>
<td></td>
</tr>
<tr>
<td>August 6</td>
<td>Workshop to review Team Management</td>
<td></td>
</tr>
<tr>
<td>October 7</td>
<td>Submit Draft Group Project Report</td>
<td></td>
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<tr>
<td>October 15</td>
<td>Workshop on public presentation skills</td>
<td></td>
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<tr>
<td>October 22</td>
<td>Environmental symposium (10%)</td>
<td></td>
</tr>
<tr>
<td>November 18</td>
<td>Submit Final Group Report (60%)</td>
<td></td>
</tr>
<tr>
<td>December 9</td>
<td>Submit Team Management Self-evaluation Report (8%)</td>
<td></td>
</tr>
<tr>
<td>December 10</td>
<td>Workshop on revising draft Individual Res. Pap</td>
<td></td>
</tr>
<tr>
<td>December 23</td>
<td>Full-time students submit Final Ind. Res. Pap (100%)</td>
<td></td>
</tr>
<tr>
<td>February 28, 1997</td>
<td>Pt-time students submit Final Ind. Res. Pap (100%)</td>
<td></td>
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</tbody>
</table>
A STRATEGY FOR ENVIRONMENTAL EDUCATION

Peter J Fensham
Monash University
Australia

Introduction

In 1989 the Government of the State of Victoria in the south of Australia set up the Victorian Environmental Educational Council (VEEC) to advise it on Environmental Education (EE) and to foster EE in schools and community. It consisted of representatives from: five ministries with direct interests in the Environment; the business community; the trade union movement; the Farmers Federation; two non-government conservation organisations; the Environmental Teachers Association; local government; primary, secondary and higher education; and three persons nominated by the Deputy Premier who was also the Minister of Education. I was asked to chair the Council and to act as a representative from higher education. The Council had a small annual budget in addition to the salaries of its staff - two executive officers and an administrative assistant.

A number of responsibilities were allocated to it, including the very major one of developing a Strategy that could involve all Victorians in EE. This was an ambitious goal because, although EE was quite significant at this time in Victoria, it was still confined to the formal sectors of education and to community groups that had an explicit conservation purpose.

Involving all Victorians

The Council began by deciding that all Victorians have an association with one or more sectors of society. By a sector of society the Council meant an association of persons who are involved together in a common social purpose or who share something in common. Thus, a sector could be based on an employment unit like a company, or a shared purpose like a school community or the farmers in a region, or be defined by a shared location of residence - local government, etc. The sectors the Council explicitly addressed in the Strategy included five sectors for Education at different levels, the State Government and its component Ministries, Local Government, Community Organisations, Industry and Business, Trade unions, Agriculture, Media and the Arts, Home and Leisure Activities. Thus, by targeting these sectors, the task of involving all Victorians would be achieved.

Discussion phase

A Discussion Paper that described and outlined the goal of the Strategy was prepared and widely distributed. A number of meetings were then organised throughout the State to which representatives from different sectors were invited and welcomed. The character of these meetings was very much to get ideas and reactions from those attending, rather than to transmit to them already formed ideas from the Council. We were interested in what sort of environmental issues they were aware of in their sector, and what ideas they had about the role that EE might play. This wide ranging consultative process proved to have very positive influence on the subsequent success of the Strategy.

Firstly, it made the Strategy well known long before it was finalised. Secondly, it meant the content and nature of the Strategy began to be quite widely discussed and anticipated. Thirdly, it gave a number of
significant persons in the community a sense of ownership in the Strategy. Finally, it identified a number of obvious persons and organisations for the Council to work with in the follow-up phase.

An exemplary or general form?

The executive officers, with help from a number of Council members who formed a Strategy Standing Committee, then began the task of building these suggestions into a first draft of the Strategy itself. Its form was the outcome of an interesting debate in the Council. Some members favoured the use of specific examples of well publicised environmental issues such as waste disposal and energy conservation (both prominent in Victoria at the time and likely to continue), and illustrations of how education in various sectors could contribute to their environmental improvement. Others, and their view prevailed, argued against specific examples, because they would have variable relevance to the sectors, could limit the usefulness of the Strategy over time, and because transfer from these examples to other environmental concerns would not be easy.

Development phase of the Strategy

The Strategy thus gradually took on the following form:

* Introduction
* What is EE?
* Guiding points for Victorian programs
* Main aims and actions
* Roles of particular sectors
* The current situation
* Looking ahead
* Resources
* Planning and co-ordination
* Monitoring, evaluating and updating

The document, entitled *Learning to Care for Our Environment, A Strategy for Environmental Education in Victoria*, consisted of 34 pages in all, 17 of which were devoted to the *Main aims and actions*, and to the *Roles of the sectors*. The first of these sections identifies aims and actions that are fundamental to achieving the purpose of the Strategy. These are the foundations for a wide range of more specific actions dealt with in the pages devoted to *Roles of particular sectors*. Eight of these general actions are described. In discussing the role of each of the particular sectors, there is a brief identification of its responsibilities and opportunities, and then this is followed by a number of very specific "foci for action".

In September 1992 the Strategy was launched by the Minister for Education under the title of *LEARNING TO CARE FOR THE ENVIRONMENT*. It was, of course, a novel document to many, but to more than 2000 Victorians and a smaller number of others in the rest of Australia and overseas who were on VEEC's mailing list it was an anticipated and not wholly unfamiliar document.

The follow-up phase could now begin.

Implementing the Strategy

The Council members had always been conscious that simply to launch a document, however tactically and carefully prepared, was insufficient. They had, thus, planned a follow-up phase based on one of the
characteristics they believed to be fundamental to EE. This is that action and learning needs to be much more closely associated (particularly in public EE) than they usually are in formal education, where action, if any, follows only after long periods of learning.

Over the 12 months that followed the launch of the Strategy, the Council established 14 exemplary EE projects with companies and organisations that were intended to show how the Strategy could be used in practice within various sectors. Some of these projects were with:

* a large multi-national hotel in Melbourne
* a road hauling company
* an airline company
* a large psychiatric hospital
* a community centre in a working class suburb
* a professional institute for engineers
* a local government authority
* a conservation organisation
* a university campus

The contract for each of these projects required the participating company (or organisation):

i. to establish a Strategy Implementation Committee with representatives from every group and level in the company,
ii. to allocate the time of a senior person to provide managing leadership in the company for the Implementation Committee's decisions and liaison with VEEC,
iii. to provide a report on the experience of the company during the EE project, and
iv. to allow VEEC to edit this report in such a way that it could be used to stimulate similar companies in the sector to undertake Strategy implementation.

In return, VEEC undertook to provide education advice and expertise equivalent to a full time consultant for 2 or 3 months. Projects usually ran for six months or more, and the companies preferred to spread them over these longer periods, which also worked better educationally, as it meant things could be tried and assessed, then revised and repeated where necessary.

It will be seen from the list above, that the Strategy was being tried in a number of cases that lay right outside those activities in society that are now known to have conservation or environmental reputations. It had not proved difficult to recruit the companies for this implementation phase. Indeed a number, because of their participation in the Discussion Phase, had expressed interest before the Strategy was complete. A fundamental assumption in these projects, that VEEC and the Strategy asked the project partner to accept, was that the most effective and long lasting conservation actions need to have an education program in association. The outcome from the projects has vindicated this assumption. The requirement that the Implementation Committees should have representatives from every level, and not just from management, was more than justified. For example, in the hospital many of the best suggestions for conservation came from the patients. In the hotel, again many ideas for actual saving of energy and materials came from the room and kitchen staff. The hotel case was of interest to VEEC, because its education program was aimed not only at all the hotel staff, but also at its clients using the hotel rooms and facilities. These people were also likely to carry some of this message back to their own organisations.

Conclusion

Not all of the projects were as successful as others, but each had its positive aspects, and some were very successful. The hotel, for example, estimated that it saved $A250,000 in the six months after the project was started, and it replicated the process in other hotels in its chain and publicised the Strategy and its savings in articles in its in-house magazine throughout S E Asia.
One valuable by-product from the implementation was the development of EE expertise in Victoria. There were many more projects than the executive officers could act in themselves, so the Council commissioned a number of other educators to act as the project consultants. These were experienced educators but they had, as yet, little experience of this type of consultancy, in which education is to support better conservation practices in contexts not obviously environmental. A number of these individuals are now continuing to act as freelance EE consultants with companies and organisations, which learn about the Strategy from them rather than from VEEC.

An important cautionary note needs to be added. Although copies of the Strategy are available from the office of the Victorian Association for Environmental Education, Church St, Richmond, Victoria, Australia, I cannot stress too strongly that it is not a recipe that can simply be repeated from the suggestions in the text. I have tried to give here a sense of the extended processes that went into the three phases of its discussion, production, and implementation. Whatever success it had, was due, we believe, to the quality of these processes. They are not easy to carry out because they challenge people and organisations to take responsibilities and to change. They need new skills and patience on the part of the educators, who are not simply transmitting information, as is so common in formal education. They can, however, be very enjoyable for all concerned because they are full of surprises. And, in the case of Victoria, they were certainly worth the effort.
COMMUNITY EDUCATION FOR ENVIRONMENTAL PROTECTION:
TWO EXAMPLES FROM VIETNAM IN
UPLAND AND MANGROVE FOREST PROTECTION

Vo Quy and Nguyen Hoang Tri
Vietnam National University
Hanoi

Protection of an upland forest

The most difficult tasks for the protection of Vietnam's nature reserves and national parks now result from the presence of settlements of local people who are living inside these areas. They carry out shifting agriculture, hunting, and forest-product exploitation for their survival, and hence present obstacles to protection activities.

Since 1987, the government has carried out a policy of resettling these people outside park boundaries and providing them with basic necessities. This programme was initially undertaken in Cuc Phuong National Park and has already had some success. But experience has shown that cooperation with local residents and recognition of their needs is a more effective means of protection than relocation alone. Buffer zones must be set up to provide employment for local people so that they do not put any pressure on the protected areas themselves. For this purpose, we cooperate with the local people by encouraging their sense of responsibility for the forest and enhancing their quality of life by helping them to plant trees and to develop alternative and stable agriculture methods that enable them to maintain their traditions, customs and culture, while at the same time conserving the ecosystems on which their lives depend. We also assist in the organizing of buffer zones in some protected areas.

These efforts have resulted in our first successful application of this approach, in Ky Thuong village. In order to reduce the pressure of the local people on the Ho Ke Go forest, we have been working with the local residents of Ky Thuong village in the buffer zone of Ho Ke Go area. Our aim has been to develop a management plan, and we have also initiated activities to improve the economy and to take pressure off the forest. In fact, the activities have stimulated protection of the forest as they have given the villagers a vested interest in conserving it and its wealth of biodiversity for their own development.

In Ky Thuong village, local residents have established - for the first time ever and without any government support - a new protected area for four of Vietnam's most endangered species of pheasant and many other threatened species including the new species of mammal, the Giant muntjac. At the same time, the activities are protecting the watershed and the rich fauna and flora of this important region.

For this purpose, we have cooperated with the local people to encourage them to care for their forests and to enhance their quality of life. We have helped them to implement an agro-forestry system, to organize home-gardens by planting fruit trees, to keep beehives and to set up mini-hydroelectric power plants. We have also trained people in how to design and manage buffer zones, and demonstrated how they can sustainably manage their natural resources. After three years, the project has been very successful, and there has been a rapid and marked reduction of pressure from local people on the forest. The people of Ky Thuong village understand the forest, they have the right to manage their forest, they can see how to benefit from it, and they protect and preserve it.

This first experiment offers great promise for our country in conserving and saving our protected areas, our biodiversity; but it also demonstrates how difficult and costly is the process of organizing and managing protected areas in a poor and overpopulated country like Vietnam.
Protection and rehabilitation of mangrove forests

Introduction

Since 1987 mangrove education has been initiated and developed by the Mangrove Ecosystem Research Centre (MERC) of Hanoi Teacher Training College No.1 (now part of the Centre for Natural Resources and Environmental Studies (CRES) at the Vietnam National University). The mangrove education program aims to respond to the challenges of mangrove degradation due to the war, over-exploitation and conversion to other uses. The program consists of curriculum development, compilation of teaching materials, and organizing training courses and further development activities for undergraduate, graduate and postgraduate students, as well as teachers.

About 10 PhD and 20 MSc projects, as well as many other graduate students, have been supervised and trained under the implementation of national and international projects, especially those sponsored by NGOs involved in mangrove plantation issues, such as Oxfam UK&I, Save the Children Fund of UK, Danish Red Cross, and Japanese Action for Mangrove Reforestation (ACTMANG). Research findings from studies have been very useful in updating and compiling further teaching materials (textbooks, curricula, and so on). The project also offers significant opportunities for people working on research in education and development.

Experience in mangrove education activities

Postgraduate level

Curriculum materials: A postgraduate mangrove textbook has been compiled for the module on “Mangrove Ecosystems”. It includes basic information on mangrove physio-ecology, taxonomy, anatomy, structure, function, and management, and policies for mangrove rehabilitation and restoration.

Advisory and training courses: Researchers of the Centre are responsible for supervising research theses on mangrove ecology for postgraduate students.

Development activities: The students have been organized to participate in mangrove planting during the practical period in certain academic years.

Undergraduate level

Curriculum materials: A large-format book on mangroves, adapted from an Australian example, has been compiled for teachers of grade 4-5 of primary schools in coastal areas. Teacher can use it as a teaching aid in classroom and outdoor teaching. It is hoped that the book will facilitate the learning process by actively involving the children themselves. The teaching skills of teachers have been improved by attention to teaching method. Over 3000 copies have been distributed by local educational services in cooperation with donors agencies (mainly NGOs working on mangrove plantation in Vietnam).

Advisory and training courses: Over a hundred key school teachers and educational officers from District and Provincial levels have attended training courses as ‘trainers for trainers’ in Hanoi Teacher Training College No.1. In this course they learn from UNICEF experts methods in using this book and undertake practice lessons in the classroom with children. It is hoped that the trainees will organize training courses in using the books for other teachers at their levels.
Development activities: Most teachers and children in communes such as Thai Bin, Than Hoa, Nam Ha, Nghe An, Ha Tinh and so on, have been mobilized to participate in mangrove planting.

Community level

Compilation of materials: A comic book for farmers entitled, “Mangroves: easy to plant, more benefits” has been compiled to meet requirements from local people who prefer some kind of books which will help their practices but are easy to understand. For effective compilation of such a book, 40 copies of the draft book were distributed prior to printing to seek advice from local people or to obtain information on how to make the book more attractive to them. As a result of this measure, the final book was received enthusiastically, not only by the farmers themselves, but also by their children.

Development activities: It could be said that the farmer book is a special guidebook for mangrove planting techniques for the local people.

Conclusion

Realizing that Environmental Education must respond to real environmental problems, the mangrove education program is aiming at improving the knowledge and awareness of people at all levels for rehabilitating and restoring mangroves which have been degraded due to various human activities. This task must coordinate ideas of experts into properly compiled curriculum materials, training courses and follow-up development activities. This has certainly worked well in the initial developmental phases, but lack of expertise and finance is now exposing some problems and shortcomings which will need to be addressed if the program is to be fully successful.
Appendix
REGIONAL SEMINAR ON ENVIRONMENTAL EDUCATION
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Hanoi, Vietnam
March 19 - 21, 1996

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