

PN-ABP-672
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ENVIRONMENTAL EDUCATION in BOTSWANA

A National Planning Conference



Environmental Education in Botswana

A National Planning Conference

*7th October to 11th October, 1991
Gaborone*

Edited by M Cantrell and M Nganunu

1992

"Toward better quality of environment and education"

This publication results from a National Planning Conference on Environmental Education held in Botswana 7–11 October 1991, organised jointly by the the Ministry of Education of the Government of Botswana, the University of Botswana, and the Kalahari Conservation Society, with support from the Swedish International Development Authority (SIDA), the United States Agency for International Development (USAID) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

Copies of this report and further information can be obtained from the
Kalahari Conservation Society
P O Box 859
Gaborone, Botswana

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ISBN 99912 - 0 - 070 - 3

Credits

Assistant editing, design and layout: Sarah Anne Hughes
Photographs: James Downey and Kagiso Keatimilwe
Printing: Printing and Publishing Company Botswana (Pty) Ltd, Gaborone

The production of this report is financed through the
Swedish International Development Authority.

The printing of this report is financed jointly through the
Natural Resources Management Programme of USAID Botswana, Project Number 690-0251.33
and by the Swedish International Development Authority

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Preface

Along with worldwide economic growth and technological development has come environmental destruction and decay. Damage to essential resources of air, soil and water now threatens life on Earth. Increasing human populations and increasing demand has led to pressure on resources—where the human demand has exceeded nature's yield of renewable natural resources, overgrazing, desertification and extinction of wildlife has resulted. Technological progress has brought pollution and in some cases, irreversible damage to the environment. By depleting and destroying our natural resources we are reducing the quality of life for subsequent generations.

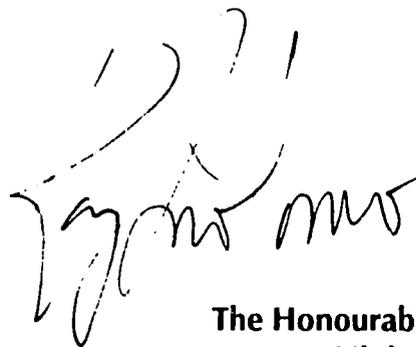
Aware of some negative consequences of development, the Botswana Government has joined in the world-wide effort to combat these problems. A National Conservation Strategy has been developed and approved by Parliament and an Agency has been set up in the Ministry of Local Government, Lands and Housing to ensure the strategy is implemented.

Education is one of the key components in the National Conservation Strategy and this Conference is a first initiative to start the planning process for environmental education. Here we refer not only to environmental education for school children, but for the whole population—a task that can only be achieved through a

joint effort of both Government and Non-Governmental Organisations. A major objective of the Conference was therefore to bring together all those who have a role to play in the provision of environmental education in Botswana.

It was in this spirit of cooperation that the Conference was planned and organised. My sincere thanks go to the University of Botswana and the Kalahari Conservation Society for joining my Ministry in organising this Conference. This I hope is only the starting point for continued consultation and cooperation. I also wish to thank the international organisations who provided financial and professional support and to the local and visiting resource people who have prompted us into taking action.

The Ministry of Education regards environmental education as a priority issue and the recommendations from this Conference will be most useful in drawing up a plan of action. My Ministry accepts that it has an important role in coordinating and promoting environmental education in the country. This includes incorporating and strengthening environmental education at all levels of the education system and working closely with other organisations, governmental and non-governmental, to provide environmental education for all.



**The Honourable M R Molomo
Minister of Education**

Introduction

The National Planning Conference for Environmental Education which took place at the University of Botswana from 7–11 October 1991 was the outcome of several developments in Botswana:

- The adoption of the National Conservation Strategy in December 1990 when Government committed itself to certain strategic measures to achieve its goal of sustainable development. One of these is to create an awareness amongst Botswana of how to achieve sustainable development.
- The start of several projects independently in the field of environmental education made it clear that some means of coordination had to be established.

- Repeated calls from international organisations such as UNESCO, WWF, and IUCN to take up the challenge of environmental education in Botswana.

The Ministry of Education, the University of Botswana and the Kalahari Conservation Society took up the initiative to bring together all parties concerned with aspects of environmental education, its coordination and expansion in Botswana. Such a co-operative effort by the three organisations would also alert decision makers to the importance of environmental education to effect lasting development.

Objectives

The specific objectives of the conference were:

- to provide background information on environmental education in general, the World Conservation Strategy, the National Conservation Strategy, and environmental problems both worldwide and in Botswana.
- to review the position of environmental education in all sectors of education in Botswana today and to generate recommendations for the future.
- to identify constraints to the improvement of environmental education in each sector.
- to evaluate further training needs.
- to evaluate research needs.
- to evaluate coordination needs.
- to draft an action plan.



The Honourable Mr D N Magang delivering his opening address

In his opening speech, the Assistant Minister for Ministry of Finance and Development Planning, the Honourable Mr D N Magang confirmed Government's commitment to achieve sustainable development in order to protect the environment for future generations. Short-term gain at the expense of a polluted and degraded environment would benefit no one in the long run. The role of education was to produce skilled and dedicated citizens who were willing to work individually and collectively to achieve and maintain a dynamic equilibrium between the quality of life and the environment. This, he stressed, requires the combined and coordinated effort of many Governmental and non governmental organisations.



Prof T Tlou (left), The Honourable Mr D N Magang and Mr P O Molosi at the opening ceremonies

In welcoming the participants, the Vice-Chancellor of the University of Botswana Prof T Tlou, said that the National Planning Conference on Environmental Education is a truly momentous occasion for the University of Botswana, especially since the country had not long ago adopted a policy on conservation. He stressed his strong belief that the University had an important role to play in interacting with society to tackle the burning issues of the day.

Conference organisation

Accepting that environmental education should be directed to all citizens of Botswana, the organisers were confronted with the difficult task of organising a conference for all sectors—formal, non formal, and informal with a role to play in environmental education. In addition to the coordinators from the three organising bodies the planning committee included a number of other key individuals including one from the government department responsible for the implementation of the National Conservation Strategy.

Participants were invited from various training institutions such as primary, secondary, teacher training, vocational, technical and university. Several Ministry of Education Departments were represented including the Curriculum Development Unit and Non-Formal Education Department, as well as all Ministries and private organisations involved in environmental issues. These included the National Conservation Strategy Agency, Department of National Parks and Wildlife, Chobe Wildlife Trust, the Forestry Association. Participants were therefore drawn from a wide spectrum of interests—educationists, conservationists, environmental scientists, policy makers, politicians and teachers. A full list is provided in Annex 3.

A number of international organisations engaged in environmental education were also invited and both the United Nations Environment Programme (UNEP) in Nairobi and World Wide Fund for Nature (WWF) in Switzerland sent resource people. The World Conservation Union (IUCN) which has an office in Gaborone, provided professional expertise both in the planning and running of the conference.

With the support of the main sponsors of the conference—SIDA, USAID, and UNESCO—some resource people from nearby African countries were invited, particularly observers from the neighbouring Southern African Development Community (SADC) countries.

A large number of local resource people were involved representing a wide range of departments and organisations. The names of all resource people, local and from further afield, are cited in the acknowledgements section.

Overall about 200 people attended parts of the conference and about 120 attended actively throughout.

From an organisational point of view the conference was divided in five types of activities:

- plenary sessions where a number of papers were presented and followed by discussions. These presentations provided background information on the environment and on environmental education both worldwide and in Botswana.
- discussion sessions in which the participants split up into groups to discuss specific aspects of environmental education.
- workshop sessions during which the participants split up into groups representing different sectors of education. Each workshop aimed at reviewing the position of environmental education in Botswana and at generating recommendations for the future. In the workshops the emphasis was on small group discussions, but some papers were also presented.
- opening and closing sessions with invited dignitaries including the Assistant Minister of Finance and Development Planning, the Vice Chancellor of the University of Botswana, the Permanent Secretary and the Deputy Permanent Secretary of the Ministry of Education, and the Chairman of the Kalahari Conservation Society.
- an evening programme which was open to the public with displays by national and international environmental related organisations; books and teaching aids for environmental education, live drama performances and puppet shows and various film shows.

A special feature on the programme was a satellite lecture and discussion with environmental education experts in the United States, made possible through the assistance of the



Delegates participating in one of the discussion periods following a plenary paper.

United States Information Service in Gaborone.

Planning took place over a number of months and a series of sub-committees were set up to deal with a host of issues both logistical and educational. The immense task of organising and running a conference of this size is difficult to comprehend unless one has been

involved. Those responsible were highly commended by participants for their efforts and are acknowledged later in the text.

The Conference was fortunate to have access to the facilities in Faculty of Science at the University for the conference including a large auditorium for plenary sessions, a number of smaller auditoriums for workshops, several small rooms for groupwork, and space for exhibitions and open air theatre. Meals and refreshments were also provided there.

Programme

Monday 7th October

- 11.00 Registration
14.30 Opening Ceremony
Chair: Mr. P. O. Molosi
Welcome Prof T Tlou
Official Opening of Conference
The Honourable D N Magang, Assistant
Minister of Finance and Development
Planning
Vote of Thanks Mr T Vanqa
15.00 Tea
Chair: Dr T T Mokoena
15.30 Global Environmental Issues
Mr D P Rychner, IUCN Representative
Overview of Environmental Problems
and Opportunities in Botswana Dr P Shaw
Cocktail Party
19.00 Evening Programme

Tuesday 8th October

- Chair: Mr. P. T. Ramatsui
8.00 Environmental Activities in Botswana
Mr. S. Liphuko
Linkages Between Development and
Environment Dr. S. Cooper
10.00 Tea
10.30 Song
Environmental Education for Sustainable
Development Mr U Carlsson, UNEP
Representative
Environmental Education : Implications
for Education Dr M Monroe
12.30 Lunch
Chair: Dr K Frimpong
14.30 Aspects of EE for discussion. Group discus-
sions followed by a plenary session and
discussion
15.00 Tea
15.30 Experiences with EE in other countries
Dr I Allen and Dr K Koeh
19.00 Evening Programme

Wednesday, 9th October

- Chair Mr. F. M. Mawela
8.00 Curriculum Development in EE in
Botswana Ms. Leburu
Teaching Methods for EE in Formal Education
Dr. M. Monroe and Mr. U. Carlsson
10.00 Tea
10.30 Workshop Sessions I
12.30 Lunch
14.30 Workshop Sessions I continued
15.30 Tea
16.00 Workshop Sessions I continued
18.00 Cocktail Party

Thursday 10 October

- Chair: Mr. L. Gleeson
8.00 Planning for Educational Education
Mr. A. Scott, WWF Representative
Experiences with EE in Primary Education
in Botswana Ms. S. Shaw
An overview of Non-Formal EE in Botswana
Mr. N. Tau
10.00 Tea
10.30 Workshop Sessions II
12.30 Lunch
14.30 Workshop Sessions II continued
15.30 Tea
16.00 Workshop Sessions II continued
19.00 Evening Programme

Friday 11 October

- Chair: Mr. N. Hunter
8.00 Presentation of Recommendations
Primary Education Ms. P. Moanakwena
Secondary Education Ms. M. Nganunu
Tertiary Education Dr. M. Cantrell
Non-Formal Education Mr. P. Hancock
Chair Mr P. V. Sephuma
11.30 How to Proceed Mr R. Stronkhorsi
12.00 Closing of Conference Mr I Nchindo
Vote of Thanks Dr M A Cantrell
12.30 Lunch

Departure or excursion

Normal Evening Programme

- Monday, Tuesday, Thursday from 19.00 – 21.00
Wednesday from 18.00 – 20.00 for invitees only
National Conservation Strategy video in English and
Setswana
Videos useful for Environmental Education
Environmental Education material
Displays by Environmental Education related organi-
sations in Botswana
Displays of books relevant for EE publishers
Displays of environmental projects and related
organisations in Botswana
Displays from UNEP, IUCN, WWF
Poster sessions on Environmental issues, legislation,
impact assessment and monitoring
of the environment in Botswana
Department of Environmental Science—Open House
Special Evening Programme Tuesday and Thursday
from 19.00 - 21.00:
Environment related play by Reetsanang
Environment related puppet show by IUCN

Primary Education—Work Session I

Chair: Mr. L. Kopong

10.30 Current Experiences in Active Environmental Education at Mochudi Education Centre using the Child's Experience Mr. T. Platte

Group discussion on the Primary School Syllabus/ Relationship with EE

12.30 Lunch

Chair: Mr. M. Masisi

Experiences with pre-and in-service training in Swaziland Dr. I. Allen.

Implications for Implementation of EE in primary schools in the Light of Experiences with other MoE initiatives such as in-service training and pre-service training Mr. L. Kopong.

Workshop Session II

Chair: Ms. F. Leburu

10.30 Relevant Experiences in Implementing EE in Eastern and Southern Africa Mr. R. Lumbe (UNEP) and Mr M Sichilongo (Zambia)

Group discussion on the Theme Lessons for Botswana followed by plenary session.

12.30 Lunch

Chair: Mr. J. Butale

14.30 Group discussion to formulate a frame-work for improving development of EE all the Primary Level

Plenary session for groups to report back and formulate recommendations.

Secondary Education—Workshop Session I

Chair: Professor A. Taiwo

10.30 Overview of status of EE in current curricular and examinations in Secondary Education Ms. S. Makgothi, Mr. C Matlare, Mr. P. Richard and Ms. F. Stoneham

EE in Junior and Senior Secondary Schools at present Mr. D. Marsland

12.30 Lunch

Chair: Dr. M. Monroe

14.30 Preparations for satellite lecture/discussion

Workshop Session II

Chair: Mr. A. Makgothi

10.30 EE in Teacher Education for Secondary Schools in Botswana, Now and in the Future Mr. R. J. Stronkhort

What would we like to achieve with EE in Secondary Education

Group discussion on the same theme

12.30 Lunch

Chair: Mrs. I. M. Kwape

14.30 Summary session with group discussion to formulate recommendations in curriculum, schools and teacher education

Tertiary Education—Workshop Session I

Chair: Professor C. Wilkinson

10.30 Existing and planned EE activities in: Health Education Mr. S. Goma

Vocational Education Mr. B. Swallender

12.30 Lunch

Chair: Professor R. Silltshena

Existing and Planned EE Activities in: Technical Education Mr. S. Manchisand Univeristy Education Mr. O. Totolo

15.30 Tea

16.00 Curriculum flexibility and EE Dr. T. Mokoena

16.45 Experiences with EE in Tertiary Education in Kenya Dr. K. Koech

Workshop Session II

Chair: Dr. J. Dubbey

10.30 What We would like to Achieve with EE in: Health Education, Agriculture Education, Technical Education, Vocational Education, University Education. Sessions have short introduction followed by group work and plenary report back

12.30 Lunch

Chair: Professor developments in: Health Education, Agriculture Education, Technical Education, Vocational Education, University Education. Sessions have introduction followed by group work and plenary report back

Nonformal Education—Workshop Session I

Chair: Mr. N. Tau

10.30 The Role of Government Departments in Non-Formal EE Mr. S. Sekhobo

The Role of NGOs in Non Formal EE Mr. P. Hancock

12.30 Lunch

Chair: Mr. P. Hancock

14.30 The Role of the Media in EE Mr. T. Mbuya
Group discussions

16.00 Tea

16.15 Report back

Guidelines for developing Non Formal Education Programmes, Mr. U. Carlsson, UNEP Representative

Workshop Session II

Chair: Ms. S. Seisa

10.30 Evaluation of Non Formal EE Dr M Monroe
Working Groups to Evaluate Existing Non Formal Education Programmes Working Groups to conduct Needs Analysis

12.30 Lunch

Chair: Mr. M. Mpotokwane

14.30 Working groups develop strategies for meeting identified needs/developing action plans

15.30 Tea

16.00 Report back by Working Groups
Recommendations

Overview of conference proceedings

Overview of global and national environmental issues—K Keatimilwe

To set the scene for later plenary and workshop discussions, Dr S Cooper, Professor P. Shaw, Mr S Liphuko, and Mr D Rychner were called upon to describe pressing environmental issues at global and national level.

The issues covered at the global level include increases in temperature, the overuse of chemicals, the depletion of the ozone layer, and the destruction of tropical forests. In Botswana, the issues of major concern affect water, rangeland, wood, wildlife, pollution, population and veld products.

The environmental problems discussed fell into two categories; those arising from pressure on resources such as overgrazing and those from development such as pollution. While it is difficult to establish a strict dichotomy between urban and rural problems, pressure on resources is largely rural, while development problems from pollution are essentially urban.

Prospects for the solution of environmental problems at the global level were not good (as illustrated by increasing social and economic problems). However, several speakers felt that in Botswana the problems were potentially manageable due to the small population and the country's economic viability. It was noted that environmental problems were likely to be significantly greater in future due to the increasing human population.

Three major themes emerged from the discussions of the broad environmental issues. These themes were the concept of sustainable development, current environmental initiatives, and required action for the sustainable use of resources.

The principle of sustainable development

Central to all four presentations was the principle of 'sustainable development'. Translated into simple terms, the concept means that our generation should use no more than the annual yield of renewable natural resources so that future generations may have access to stocks similar to those currently available.

The closely allied concept of carrying capac-

ity implies the existence of a maximum rate of resource consumption and waste discharge that can be sustained indefinitely without impairing ecological productivity. It is important to appreciate that carrying capacity is determined by the single vital resource in least supply rather than by the shortage of all resources.

The limitations on resource use imposed by Botswana's harsh environment such as poor soils, high temperatures, fragile grazing lands, and lack of sufficient water must be understood as they adversely affect sustainable development. Environmental problems arise when these constraints are ignored in preference for short term benefits which, in fact, have long term costs.

Preference for short term benefits also threatens the survival of plant and animal species which constitute ecological systems. Ecological systems are important because of the interdependence between the natural environment, human life and economic development.

Finally, the principle of sustainable development suggests that equity between generations and social groups, and selfdetermination are important pre-requisites for ensuring that development is attained.

Current environmental initiatives

The most important response to global problems to date is probably the 1987 report of the World Commission on Environment and Development which defined a broad consensus over major issues. Currently, a number of initiatives including the Montreal Protocol, Caring for the Earth, and the Global Environment Facility have been initiated and address climate change, bio-diversity and ozone layer depletion.

Within Botswana, the Government is in the process of establishing conservation institutions in the form of a Natural Resources Board and a secretariat as part of the implementation of the National Conservation Strategy (NCS). In future it is envisaged that Environmental Liaison Officers will be appointed in government ministries to ensure that the policies of the various ministries conform to the requirement of the



Delegates discussed issues in greater depth in work groups.

NCS. In addition, two statutes are envisaged. The first will establish the Board and its secretariat, and the second will introduce the notion of compulsory environmental impact assessments for all major projects.

The NCS will also implement projects covering sectors such as forestry, veld products, wildlife, and land rehabilitation. Activities currently being undertaken by other Government Departments include the formulation of policies on tourism, agriculture, and wildlife as well as the improvement of sanitation under the Accelerated Land Servicing Programme. More needs to be done, such as in the area of solid waste management and the management of grazing land. Political will and financial investment is required to achieve the goals of the NCS.

Required action

All four speakers suggested that a change in attitude towards the use and conservation of resources was required at all levels of Botswana society. This needed to be reflected in individual behaviour as well as a societal environmental conscience. While education was considered fundamental to effect change in attitude, the

establishment of standards and regulations, as well as the use of fiscal benefits and penalties where necessary were also strongly advocated.

Following this line of thought, the increased use of environmental impact assessment was essential to identify, predict, and mitigate impacts. Economic diversification and its concomitant benefits was also urged since people could only participate effectively in conservation if they were part of the process and gained from it.

Background information on environmental education—R Stronkhorst

National Conservation strategies have followed in the wake of IUCN's World Conservation Strategy of 1980. These emphasise the need for sound environmental education to effect change in attitudes and behaviour. Central to the strategies is that education should stress 'sustainable development'. This implies that certain qualities or values of the environment should be taught and safeguarded.

Four basic values of the environment can be distinguished:

- Utilization Value—The Earth's resources form the basis for our (economic) development (used in production processes).
- Security Value—The Earth provides safe

- places where mankind can live and enjoy life.
- **Health Value**—Mankind requires an unpolluted and stable environment to be able to sustain itself.
- **The Diversity Value**—The natural information (contained in the gene pools) of the earth's biota is crucial for the sustainability of life on this planet. This can only be achieved through maintaining nature's diversity.

Development can only be sustainable if the environmental problems it creates are not carried and magnified into the future or copied by others. In other words, sustainable development also means solidarity and a common appreciation of the values mentioned above by all inhabitants of the planet. Clearly this is an enormous task and environmental education is only one of the measures necessary to gain a consensus to protect planet earth.

As Carlsson pointed out in one of the plenary sessions, UNESCO-UNEP launched its International Environmental Education Programme in 1975 and this was later followed in 1987 by its International Strategy for Action in the Field of Environmental Education and Training for the 1990s. In these programmes the principle of sustainable development already mentioned has been translated into educational goals, the most general and one used throughout the world as a guide for curriculum development and research being

“to aid citizens in becoming environmentally knowledgeable and above all, skilled, dedicated and willing to work individually and collectively toward achieving and maintaining a dynamic equilibrium between quality of life and quality of the environment”

Further detailed educational goals and objectives with regard to knowledge, skills and attitudes have been developed from this basis. These provide a useful starting point for environmental education in Botswana and can then be adapted to the country's specific situation and its modes of delivery within formal and non-formal education.

The ultimate goal must be to foster a universal environmental ethic in which citizens unite in a common cause according to the slogan “Think Globally, Act Locally”.

Providing information and equipping mankind with knowledge is clearly important to effect changes in personal behaviour towards the environment. However, beliefs, attitudes and values are equally important determiners of behaviour. Environmental education programmes which does not cater for this through incorporating elements of moral or value education are unlikely to be effective.

Another important aspect is to provide skills with which people can investigate and evaluate environmental problems and undertake appropriate action within their community. It is important therefore that environmental education is participatory and focuses on the local environmental problems, be they around the school, village or community since that is where change should take place.

Effective environmental education demands much from those who teach it: school teachers, lecturers, extension workers, education officers and others. Training of these educators therefore is a paramount importance.

To develop an effective programme in Botswana requires careful planning and coordination and should be based on experiences elsewhere. The planning conference is the first and major step in the right direction, focusing as it does on working “Toward Better Quality of Environment and Education”

The current status of environmental education in Botswana and planned developments for the future

This section reviews current initiatives in environmental education at different levels of the educational system and the activities planned for the future.

Primary education—P Moanakwena

Discussions in the Primary Education Workshop focused on three topics, namely:

- Current experiences in environmental education in Botswana.
- Pre- and in-service training; implications for implementation of environmental education in primary schools.
- Relevant experiences in implementing environmental education in Eastern and Southern Africa.

The first topic was addressed by members of the environmental education Advisory Committee of the Mochudi Education Centre, one of an increasing number of regional education centres in the country. The Committee works with primary schools in the Kgatleng district and offers advice and resources to teachers. Activities in schools are initiated by the teachers themselves according to individual needs. The committee then helps teachers plan activities while the Education Centre also offers resource materials in its library which teachers can use. The Centre has set aside one day in the week for visits from schools.

The location of the Centre along the banks of Notwane River makes it ideal for environmental

education activities. While at the Centre, pupils experience hands-on activities which continue to evolve as more groups attend. Decision-making and problem-solving are major skills that are encouraged in the pupils.

Although the presentation was meant to generate discussion, it turned out that most of workshop participants had not experienced the environmental education programme at the Mochudi Education Centre and were therefore more interested in learning about the activities of the Mochudi Group.

The need for a comprehensive training programme was emphasized in the next talk by Dr Irma Allen of the Ministry of Education in Swaziland. In her presentation she outlined the scope for pre- and in-service training to enable teachers to integrate concepts of environmental education in their teaching. With clearly stated objectives, the concepts can be integrated into the existing curriculum, although teachers need training in techniques of integration for teaching and learning. A prerequisite for effective in-service training was an organisational structure through which this can be achieved. The multiplier effect, whereby training filters from a national group of trainers to the rest of the teachers seems to be the most effective structure to use.

This approach is not without its problems as there are often no incentives for experienced teachers to volunteer as in-service trainers. As with other innovations, the use of the multiplier effect to reach large numbers of teachers needs careful monitoring.

Still within the framework of pre- and in-service training, Mr L Kopong led the group in a discussion on the implications of implementing environmental education in the light of other Ministry of Education initiatives. Here, the need for coordination between the different departments in education was emphasised. It was felt that aspects of environmental education need to be addressed by all educators in the country although the priorities of different groups would differ. An effective network to facilitate communication was essential and would do much to curb problems such as duplication of effort and wastage of resources.

Mr R Lumbe from UNEP and Mr M Sichilongo of Zambia made presentations of regional interest and guided discussions on the involvement of non-governmental organisations in environmental education. Through the efforts of clubs such as Girl Guides, Red Cross, Young Women Christian Association, and Wildlife Clubs, pamphlets and magazines have been circulated among communities to raise environmental awareness. In Zambia, the Chongololo Clubs produce magazines for upper and junior

secondary, and a newsletter for the communities. Radio was seen as a useful medium for the dissemination of information, with programmes directed to both school and out of school populations.

The value of the local Gaborone Game Reserve as a resource for extra-curricular activities was presented by Mrs D McColaugh. A guidebook is currently being prepared which can be used by teachers and pupils.

Secondary education—M Nganunu

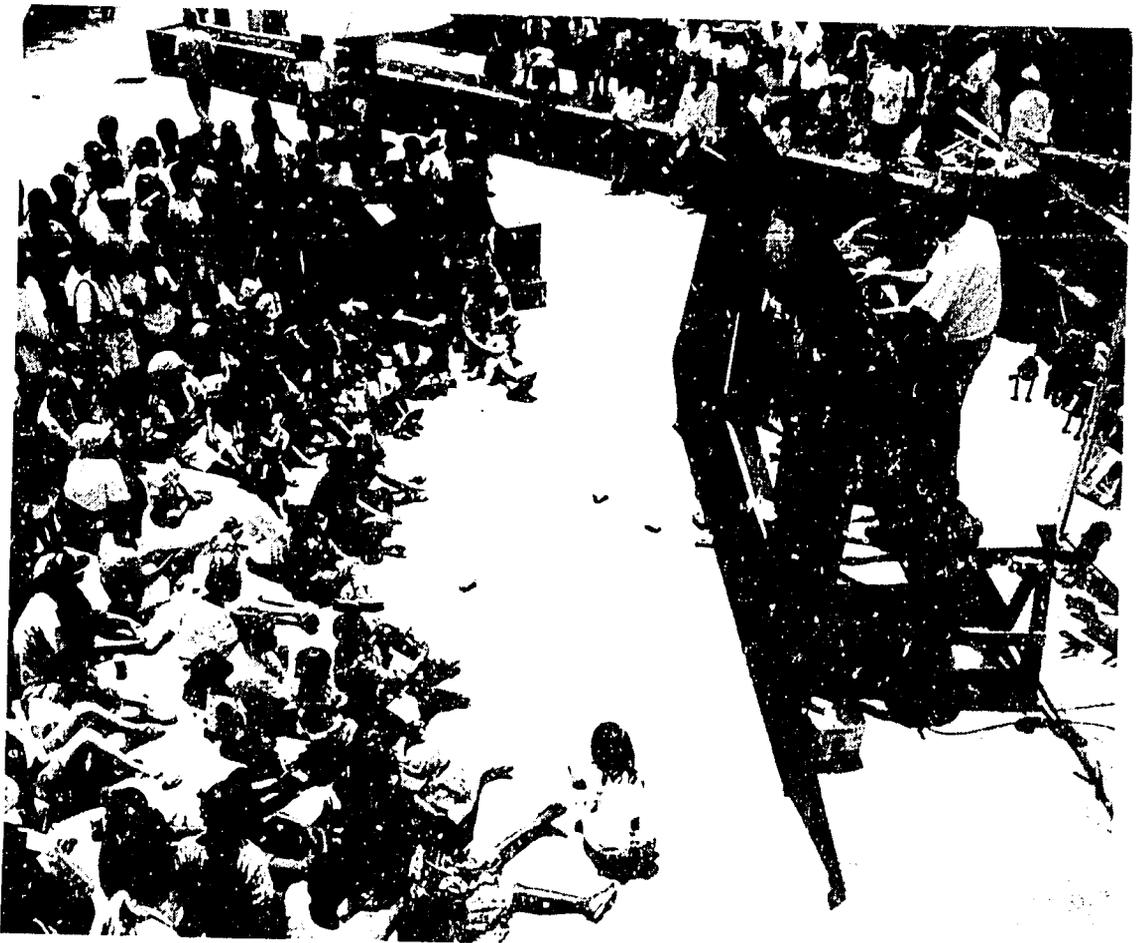
The three presentations in the secondary workshop covered the inclusion of environmental issues in existing syllabi and examinations, the teachers' interpretation of this, and the role of pre- and in-service teacher training in this process. These topics then formed the basis for evaluation, discussion and proposals for new strategies. Through small group discussions, recommendations were phrased to suggest the way forward.

A Ministry of Education team of Ms S Makgothi, Ms F Stoneham, Mr P Richard and Mr C Matlhare, representing a range of subject areas, presented a joint paper on the present status of environmental education in curricula and examinations. In Social Studies, Integrated Science and Agriculture a number of topics on the syllabi can be identified as environmental issues, both at junior and senior secondary school. It was also pointed out by the presenters that the integrated nature of the subjects Social Studies and Integrated Science facilitates the incorporation of environmental issues which in themselves are integrated.

Since environmental education is not treated as a separate subject in the curriculum, there is no special provision for it in the examination. However, any topic that is on a syllabus, including environmental topics, can be examined using the form of assessment for that subject.

The presenters concluded that the curriculum does cover an extensive amount of content about the environment but lacked an emphasis on special issues such as application of knowledge, practical work and developing positive attitudes towards environmental issues.

Overloaded curricula, lack of time for pupil involvement, large class sizes, and the examination system were raised as constraints during the discussions. Suggested solutions included cutting out topics from the syllabus which were less relevant, better coordination between curriculum developers to avoid syllabus overlap, and teaching more skills and less content. It was pointed out that knowledge is changing fast and rather than load syllabi with the 'today's knowledge' more self-study skills should be taught to prepare students for 'knowledge of tomorrow.'



Evening events for the general public included a puppet show highlighting environmental issues

The issue on whether or not environmental education should be a separate subject was discussed in several fora during the conference. In the secondary workshop, the consensus was that environmental issues are integrated by their very nature and therefore must be integrated into all subjects. Sometimes this can be done by giving a topic an 'environmental twist' and the following is an example of that.

In the English syllabus there are no specific environmental objectives, but the experiences of a participating English teacher indicated that much can be done. When teaching descriptive composition, students were taken out in the school garden for some discovery learning. Working in pairs with one blind folded, the task was to use the senses to experience the environment (the trees and the insects) through listening, touching, and smelling. After this, students returned to the classroom to write down their experiences. This little exercise, although an English class, enhanced environmental awareness by bringing the students in close contact with nature which therefore became more alive for them.

It was agreed that environmental issues also

provide ideal topics for debating, though much depends on the initiative of the individual teacher. Here, national coordination and encouragement was needed to ensure all subjects/teachers play their part.

Consideration of these issues led to a proposal for a national coordinator for environmental education in the Curriculum Unit, working closely with all subject panels.

Mr D Marsland, a field education officer in Ngamiland, reported on a study amongst school teacher about their background knowledge, approaches and attitudes towards environmental issues on the curriculum. This was not intended to be a comprehensive research project but rather a way of collecting material to stimulate discussion during the conference. The respondents were primarily teachers of Integrated Science, Social Studies and Agriculture.

Indications from this small survey were that teachers' knowledge of basic environmental issues often falls short of what is required to teach these issues. Further, some teachers did not recognise parts of their syllabus as having significant environmental content and often omitted these sections.

Reasons advocated for this were that environmental education had never received strong emphasis in pre- and in-service teacher training, teachers may have poor private study habits or

may simply not have easy access to suitable literature. This study indicates that teacher training on environmental issues and methods is needed to provide teachers with the basic skills, to identify the range of issues that relate to the environment and to adopt appropriate teaching techniques. This is necessary both to instill information and to change attitudes and behaviour.

Another revelation from this study was that teachers outside science/ agriculture/social studies rarely used the environment as a teaching resource. Even where teachers were required to use the environment as a component of their course they often fail to do so. The excuses offered were that time was not sufficient to take students out, other classes would be disturbed, or lack of transport.

Drs R Stronkhorst in his paper on teacher education stressed that teacher training was a key factor in the development of environmental education, a point highlighted in the National Conservation Strategy. He reported that the introduction of environmental education in teacher training curricula had regrettably been limited to the addition of a few elements of content.

He advocated that teaching methodologies should be significantly broadened and there was a need to identify and develop special environmental education competencies which include skills and behavioural objectives. Although certain subjects had a larger role to play in environmental education than others, nevertheless, all subjects were involved. Since behavioural objectives were dominant, teachers needed to lead by example as suitable role models.

He emphasized that in-service, including that at MEd level, would be required to prepare teacher educators and curriculum developers to take a lead in environmental education development and implementation.

One exciting and unusual aspect of the workshop was an inter-continental discussion. Through a satellite link organised by the United States Information Service, it was possible to have a discussion between participants in Gaborone and a panel of well-known educationalists in America. In response to questions from conference participants, the panel stressed that attitude development was important. They recommended a focus on students' values, asking students to consider the consequences of their values and to share them with others. The teacher's role in this context was to get students to confront their own values, but not to impose them.

The panel emphasized that it was not sufficient to make students aware of issues; they

needed to become attached to them—this could then lead to empowerment and to action. The panel suggested that students should be involved in choosing environmental issues of interest to them rather than have issues of little relevance dictated by the teacher. The panel admitted that there were difficulties in assessing attitude change, but some research was underway in this area.

In the next session, workshop participants were split up into groups and given the following questions to focus the discussion with a view to come up with recommendations for the future:

- With the pupil in mind, what should be the end product of environmental education?
- What can be done about the curriculum to produce the desired change?
- What can teacher training institutions/ school teachers do to produce that desired change?

The secondary workshop finally adopted the UNEP goal for environmental education, cited previously.

This goal could clearly not be achieved by schools alone, but schools should be *one* of many contributors.

It was agreed that the Curriculum Development Unit has a key role to play in achieving the goal. It was suggested that an 'environmental ethos' be introduced into teacher education, not just into education courses but into the whole philosophy of each teacher training college. Some of the desired competencies could be developed in the everyday life of the college, while others would be specifically taught in courses.

Current and planned activities at tertiary level—M Cantrell

Unlike the primary and secondary workshops which dealt with single sectors of education, participants in the Tertiary Workshop were drawn from many different tertiary institutions with only technical and vocational training institutions being closely related (The Botswana Polytechnic and BRIDEC). The other institutions included the Ministry of Health, Botswana College of Agriculture and the University of Botswana.

Some of the speakers had tried to assess the current status of environmental education through questionnaires. In most cases feedback was limited and this led speakers to assume that education about the environment was neither perceived as important by staff nor emphasized in the curricula of their various institutions. Although admitting that other means of collect-

ing information might have created a more positive picture, speakers concluded that much needed to be done to create an awareness of the importance of the subject.

The future initiatives mentioned were largely the hopes and aspirations of the speakers rather than definite measures which had been agreed at an institutional level.

The workshop also heard from Dr M Koech about the experiences of Kenya in the introduction of environmental education programmes over the years.

Mr S Goma of the Environmental Health Unit of the Community Health Service, Ministry of Health stressed the importance attached to environmental health education in the Primary Health Care Programme in Botswana. Several dominant causes of ill health are associated with inadequate environmental sanitation and lack of safe water supply. Health education therefore targets those conditions which are detrimental to health. Currently health education took a holistic approach; focusing on the social context in which the patient lives—the economic, political and environmental factors which have a negative effect on health.

Besides the Primary Health Care Programme, Mr Goma emphasized that all training programmes at the National Health Institute have a basic course in health education with core elements on environmental issues. These include not only the nursing courses but also those for medical laboratory and pharmacy technicians.

In future, a three year diploma in Health Education had been approved and would start as soon as staff and resources had been allocated.

Dr W Kelly, visiting professor at the Botswana College of Agriculture (BCA) reported that key environmental issues such as soil erosion receive attention in colleges of agriculture throughout the world. Despite this, problems persist and dominate agenda because they were tackled in purely technical terms whereas cultural, social and economic aspects were ignored. He felt that in general, the relationship between agricultural practices and their long-term impact on the environment was not sufficiently emphasized.

His personal view was that environmental education should be integrated into existing courses which should emphasize the development of a 'sustainable agricultural system' for Botswana. He stressed that environmental problems were usually linked to poverty and that the BCA curriculum should be developed with the complex interface between socio-economic development and environmental concerns in mind.

Two speakers from technical training institutions reported that environmental education did

not feature in existing programmes to any extent. Mr S Manchisi examined some of the reasons for this at the Botswana Polytechnic focusing on the problem of imported curricula. These by their nature could not address pressing national concerns and were generally deficient in environmental issues.

At the artisan level, Mr B Swallander of BRIDEC, reported that many instructors themselves were not well informed about sound environmental practices. This meant that trainee builders and other construction workers in the Brigades received little or no training about waste disposal or the inherent health dangers of many of the materials such as asbestos with which they were working.

Both speakers stressed the need for curriculum change so that students in technical training were aware of the day to day hazards of the industrial processes and materials they were using, and the safe disposal of waste products.

Following a survey of University of Botswana departments, Mr O Totolo reported that at least seven departments taught elements of environmental education, particularly the Environmental Science Department which offered courses to Masters level. This department was unique in providing courses across the faculties. However, there were few interdisciplinary courses offered and there was little collaboration between departments. He cited several extra-curricular initiatives by concerned university students and staff and emphasized that all students should be made aware of the environmental problems of the country as a matter of priority.

Mr Totolo reported that a new Masters in Environmental Education was being designed jointly by the Departments of Environmental Science and Languages and Social Science Education which would cater for school teachers.

The Dean of the Faculty of Science, Dr T T Mokoena then considered appropriate routes for the introduction of more environmental awareness into the curriculum at tertiary level, noting the compartmentalised way in which courses at UB and elsewhere were currently delivered under department-based subject systems.

Key issues addressed were the need for a Governmental commitment to environmental education within the framework of its 'basic education for all' policy. This would then facilitate the formation of university guidelines and widespread consultation and exposure of the university community to recent trends in environmental education elsewhere. He advocated a phased approach with modest beginnings based on the existing subject system, with stronger lateral links between departments leading eventually to more inter-disciplinary courses.

Non-formal sector—S Hughes

Given the wide variety of interest groups linked by the term non-formal education it is not surprising that the presentation in this section covered an equally wide variety of subjects. Mr Sekhobo speaking from the Department of Non-formal Education gave a definition of non-formal education and reminded the workshop that this encompassed subgroups within the community of all ages. In explaining the role of the Government he emphasised they were not the sole provider of non-formal education and said that the large target audience was fertile ground for the work of environmental education. He then listed the main environmental resource problems and commented that there was a general lack of awareness of these problems. In reaching this audience he identified several categories for targeting and explained that the National Literacy Programme was developing reading material based on these developmental issues.

Representing the media, Mr Mbuya from the weekly newspaper Mmegi, argued that the local media could be more effective in disseminating news about environmental issues. One problem was that the media in Botswana was underdeveloped and that many editors did not see the environment as a big story. He also pointed out that as all the newspapers were in English any environmental issues that were reported were not available to the majority of people. A further problem was that environmental issues were hidden by Government departments and much of it was highly technical. Seminars and workshops would help journalists to understand these technical issues better so that they in turn could provide the basic technical information so badly needed on environmental issues.

Mr Carlsson from UNEP explained his view that non-formal education had the advantage over other forms of environmental education in being flexible and being able to pick its target audience. He explained that education could be either participatory (such as group discussions, drama, community projects) or non participatory (such as media, publications, exhibitions and lectures). Community projects were prob-

ably the most effective way of educating people about the environment and non-formal teachers needed to be more innovative than teachers in other areas. In addition, evaluation was an important part of any non-formal programme.

Following a review of the main NGOs involved in environmental education in Botswana, Mr Hancock from the IUCN office in Gaborone showed the scope of the programmes covered by these organisations. Hancock explained his view that most programmes failed to provide a balance in presentation techniques and relied too heavily on dissemination of information without including teaching techniques that allowed action. He singled out the Wildlife Clubs of Botswana as an example of a form of non-formal education which did provide a well rounded approach.

Evening programme—M E K Masisi

Realizing that participants would welcome activities during the evenings, a varied programme was arranged including receptions, film shows, displays of books and other literature by the major publishers, posters and exhibits by environmentally orientated NGOs (see acknowledgements section).

It was felt that issues addressed by the conference should reach as wide an audience as possible, so the public was invited on two evenings when additional activities were arranged. One attraction was the Reetsanang Drama Group, whose play was written specially for the conference and graphically described environmental issues such as pollution, sustainable arable farming and sanitation. The bilingual performance (Setswana and English) was well received by the audience and was followed by another special attraction; a show by Tshomarelo Puppets under the auspices of IUCN. This contained various sketches including one which highlighted the effect thoughtless tree felling would have on the environment in the long term. This was followed by a sketch about discarded tin cans and, using tin can puppets, addressed not only aesthetic issues, but also the threat posed by discarded cans to good sanitation and environmental management.

Recommendations

In the workshop sessions participants had the opportunity to discuss environmental education issues in more detail, to evaluate the present status of environmental education in Botswana and to formulate recommendations on how to proceed. The recommendations are therefore presented and grouped according to the focus of each workshop. These recommendations were presented at the plenary session on the final day of the conference and adopted.

Primary education

The objective of the Primary Workshop was to formulate a framework for improving environmental education at primary school level. Future developments should build onto existing environmental activities both in and out of the school.

Recommendations

Curriculum issues

- National goals for the teaching of environmental education should be clearly stated.
- Existing objectives should be re-emphasised
- committee on integration should be set up to facilitate the writing of materials across the curriculum
- Monitoring and evaluation of environmental education programmes should be undertaken on a regular basis.
- Environmental education components should be tested in national examinations.
- Curriculum content should have room for regional variation in the country.
- The focus of environmental education should be on the processes creating environmental issues .
- There should be links between environmental education in pre-school, primary and higher levels of education.

Teacher training

- Teacher training should give students a background in environmental issues as well as appropriate methodologies for teaching environmental education. This should be

within the context of other subjects of the curriculum.

- In-service training should use the existing multiplier effect network for inservice training with the aim of training all concerned people.

Organisational and communication structures

- For effective environmental education, clear organisational and communication structures between different concerned bodies as well as at different operational levels should be set up.

Resources

- The integration committee should take advantage of issues and use activities that fall outside formal education.
- District environmental education committees are needed to be a link between environmental education in schools and communities and to coordinate activities.
- Local personnel should be used to address environmental issues that teachers are unable to address.
- Funds should be made available for environmental education programmes and support systems for their implementation.

Secondary education

The objective adopted by the secondary education group was to make pupils environmentally knowledgeable skilled and dedicated citizens. These should be willing to work individually and collectively toward achieving and maintaining a dynamic equilibrium between the quality of life and quality of the environment.

Education in schools will be *one* contributor to this objective.

Curriculum

- Environmental education has a key role in secondary education and should be incorporated into *all* subjects.
- A national environmental education coordinator should be appointed to oversee the introduction of environmental education.
- A curriculum panel for environmental educa-

tion, with representation from all subject areas, should be formed.

- An environmental education curriculum should be developed but integrated into present subjects.
- Specific objectives should be formulated in the following areas: acquiring knowledge, gaining awareness, developing skills such as investigative, action and evaluation skills.
- The examination system should include continuous assessment since some environmental education objectives cannot be tested in written examinations.
- The Cambridge Syndicate should be asked to include elements of environmental education relevant to Botswana.
- A needs assessment be done on whether to introduce environmental education as a separate subject in senior secondary schools.
- The Ministry of Education, with support from NGOs, should provide support to teachers in the form of funds, reading materials, videos, transport.

Teacher training

- A set of basic environmental education competencies should be formulated for *all* secondary school teachers and additional specific competencies identified for Science, Social Studies, Agriculture, Home Economics, Religious Education, Design and Technology, and Art,
- An assessment should be made to determine which of these competencies are already catered for in everyday life of the college, its existing courses and extra curricular activities.
- Aspects missing should be infused into existing courses or into new courses and a variety of extra curricular activities to promote environmental education should be encouraged.
- Based on a needs assessment, an environmental education in-service programme for teachers should be developed.
- Masters degree programmes in environmental education should be developed for curriculum developers, school coordinators and teacher educators.
- Environmental education in-service for teacher educators should be provided.

School level

- To reinforce positive environmental attitudes in students incentives including competitions, prizes or entertainment as reward for community work should be given.
- School projects should be encouraged and supervised by teachers (e.g. ponds, rockeries, compost heaps, aquaria).

- A student environmental education council should be formed at village and town level to co-ordinate local environmental education activities and to infuse environmental awareness into existing youth groups such as 4B and school clubs. A parent could act as the coordinator and a teacher as a technical adviser.

Tertiary education

The aim of the proposed environmental education programme at tertiary level would be to provide staff and students with the necessary knowledge, skills and values to mobilise them into addressing environmental issues.

The objectives identified were

- to establish a set of values to underscore the environmental education programmes at each tertiary institution,
- to demonstrate to the community at large, principles of recycling, energy saving and other resource conservation measures,
- to infuse environmental education into existing courses at tertiary level, and
- to ensure that all students have access to a core course in environmental education (cross-faculty or cross-department) to facilitate the infusion process in later more specialised programmes
- to make students aware of the health and safety aspects of the technology and waste products in their discipline, both for themselves, their immediate environment and the biosphere.
- to make students aware of opportunity costs of the various alternative strategies
- to make academic staff aware of environmental issues pertinent to Botswana
- to establish research programmes both by faculties and their students on environmental issues and environmental education.

It was agreed that a 'mission approach' was called for. The normal attributes of university courses—awareness, knowledge and skills had to lead to attitude changes and citizen participation. To achieve this staff should include effective teaching in their courses so bringing about new values which could be translated into action.

Each institution should lead the way in formulating policies of recycling and energy saving. The name of this programme should link economic development with sustainable use of natural resources.

Actions

The formation of a National Tertiary Environmental Panel (or similar coordinating committee) is proposed with close links to the

Environmental Resources Board. The panel should seize on initiatives written into NDP7 and the NCS. High level representation of various institutions at the formation of this board is crucial. Its role would be in assisting and encouraging tertiary level institutions to meet the objectives listed above by

- providing environmental education workshops for academic staff; both for the orientation of new staff to pressing environmental issues in Botswana and also to assist longer serving staff to infuse environmental education into their subject areas
- providing workshops on health and safety. In both cases, common workshops for various institutions are to be encouraged.
- assisting institutions in the design of flexible curricula.
- supporting student and staff extra curricular clubs and action groups on environmental matters.
- stimulating the development of new undergraduate and postgraduate programmes on environmental issues and education.
- coordinating the airing of key environmental themes for institutions to focus on periodically.
- monitoring and evaluating the impact of environmental education at the various institutions.
- attracting funds to support such initiatives.

Non-formal education

The non-formal sector is diverse in terms of organisations, target groups and media employed. However participants in this group share common goals. These factors influenced the recommendations which were made:

Recommendations

- Improved co-ordination was required through an umbrella body or coordination committee. The NCS Coordination Agency would play a central but not exclusive role in this regard. NGOs, the private sector, Ministry of Education and other government departments should be included. However,

organisations should cooperate to make best use of existing non-formal education programmes and infrastructure before developing new initiatives.

- Basic information related to non-formal environmental education is required on current levels of awareness and effectiveness of programmes. Relevant organisations should be encouraged to undertake applied research in environmental education.
- Since environmental education is a relatively new discipline in Botswana there was a need for training. This aspect should be investigated further by the umbrella body to provide for the needs of both trainers and trainees involved in non-formal environmental education.
- For non-formal environmental education to be accorded its rightful place in the education system in Botswana, it should be supported by appropriate legislation. A National Policy on (non-formal) environmental education be formulated through the umbrella body.
- Non-formal environmental education programmes require improved funding. The umbrella body should identify priorities for non-formal environmental education to present, through the NCS Coordination Agency, to donors for funding.
- An environmental education association should be established to provide a forum for addressing some of the recommendations generated by the conference.
- Environmental educators should take care to cater for the disabled.
- All aspects of environmental education should be gender neutral. In Botswana, the main environmental concerns are those of water, deforestation, over-grazing, veld products, overpopulation, pollution and wildlife. Within all these areas, women are significant users and in many cases, victims of environmental degradation. It was therefore recommended that issues be addressed from a gender sensitive and holistic perspective in order for current class and gender inequalities to be identified and addressed.

How to proceed

The need to coordinate the planning and implementation of environmental education was strongly expressed by all participants. They agreed that the conference had played an important role in increasing their environmental awareness and personal commitment, but to ensure continued and effective action, a formal structure was required. The conference recommended the establishment of an umbrella body for environmental education with representation from a wide range of both government and non-government organisations. This body would advise on policy issues and provide direction and orientation for environmental education.

An environmental education coordinator, with their own office and staff would be essential to facilitate flow of information between the groups and organisations concerned. This is particularly important in this field since environmental education is not usually taught as a subject in its own right but permeates many different subjects and courses. It was proposed that the Department of Curriculum Development and Evaluation in the Ministry of Education takes on the coordinating role for the umbrella body.

It was also stressed that the task ahead was too large for any single organisation such as the Ministry of Education to tackle on its own. To enable an environmental education campaign to have some impact, it was necessary for all organisations to work together. As not all could be represented on such an umbrella body, there was ample room for others such as non-governmental organisations or tertiary institutions to target more specific groups.

In the plenary session at the end of the conference, participants called for immediate action. Many of their recommendations could be implemented by individual institutions and organisations without delay. For example,

schools could get involved in environment-related community projects, educators could infuse environmental issues into existing courses, tertiary institutions could develop an environmental ethos and set an example by reducing unnecessary waste of energy and resources. An immediate response by non-governmental organisations to produce more support material for environmental education, and initiate relevant research projects was expected. Since all participants were members of groups or organisations able to implement aspects of environmental education, a strong multiplier effect was expected.

Other recommendations required a formal structure for implementation. This applied for example to changes in curricula and examinations, the introduction of new courses at tertiary level and to legislation. Teacher training was identified as a starting point for a National Action Plan and involved the challenge of changing personal attitudes as well as imparting knowledge. This would involve both pre- and in-service teacher training and trainers at all levels, that is, teachers, lecturers and extension workers.

During the five-day conference it was not possible to cover all topics in any great depth: the conference could only hope to sensitize participants to areas of environmental education which need further attention. In their evaluation participants suggested that the following issues should be given more attention and could form themes for follow-up workshops at either district or national level:

- the role of local communities in environmental education
- gender issues in environmental education
- teaching methods for environmental education.

Using the recommendations in this report as a starting point, the Ministry of Education agreed to draw up an National Action Plan.

Acknowledgements

The success of the conference was due largely to the generous financial assistance of the sponsors and the dedicated efforts of a large number of individuals who helped in the numerous ways.

The sponsors

The main sponsors of the conference were:

- Swedish International Development Authority (SIDA)
- United States Agency for International Development (USAID)
- United Nations Educational Scientific and Cultural Organisation (UNESCO)

Generous financial and professional support was also provided by:

- United States Information Service (USIS)
- World Conservation Union (IUCN)
- United Nations Environment Programme (UNEP)
- World Wide Fund for Nature (WWF)

In addition, assistance in various forms was received from:

- MacMillan Botswana (Pty) Ltd
- Metal Box Company (Pty) Ltd
- Sanitas (Pty)
- Gaborone City Council
- National Museum

Special guests

The organisers would like to thank the Honourable Assistant Minister D N Magang, the Permanent Secretary for Education, Mr P O Molosi and the Vice-Chancellor of the University, Prof T Tlou for officiating at the opening ceremony. The Deputy Permanent Secretary of Education, Mr P Sephuma and Chairman of Kalahari Conservation Society, Mr I. G Nchindo are thanked for closing the proceedings, and thanks are due also to the Ambassador for the United States for hosting the cocktail party.

External resource persons

The organisers are particularly grateful to the Environmental Education

following resource persons who came from afar and did so much to lead discussions and stimulate ideas; Mr Ulf Carlsson and Mr Richard Lumbe both from UNEP in Nairobi, Dr Martha Munroe from the North American Association for Environmental Education, Mr Alistair Scott from WWF headquarters in Geneva, Dr Irma Allen from Swaziland Ministry of Education, and Dr Michael Koech from Kenyatta University in Nairobi, Kenya.

Local resource persons

Many local resources persons were also involved in presenting papers or chairing sessions. Our thanks go to Mr J Butale, Dr M Cantrell, Dr S Cooper, Mr J Dubbey, Dr K Frimpong, Mr L Gleeson, Mr S Goma, Mr P Hancock, Mr N Hunter, Prof W Kelly, Mr L Kopong, Ms I M Kwape, Ms F Leburu, Mr S Liphuko, Mr A Makgothi, Ms S Makgothi, Mr S Manchisi, Mr D Marsland, Mr M Masisi, Mr C Matlhare, Mr F M Mawela, Mr T Mbuya, Ms P Moanakwena, Dr T T Mokoena, Mr M Mpotokwane, Ms M Nganunu, Mr T Platte, Mr P T Ramatsui, Prof H Rempel, Mr P Richard, Mr D P Rychner, Ms S Seisa, Mr S Sekhobo, Dr P Shaw, Ms S Shaw, Prof R Silitshena, Ms F Stoneham, Mr R Stronkhorst, Mr B Swallander, Prof A Taiwo, Mr N Tau, Mr O Totolo, Mr T Vanqa, Prof C Wilkinson.

Organisers

The executive co-ordinating committee consisted of Rob Stronkhorst, Marianne Nganunu and Mike Cantrell. The editors wish to acknowledge the drive and dedication shown by Rob Stronkhorst in directing the preparations for the Conference.

Coordinators of the programme sub-committees were Mike Cantrell, Pete Hancock, Kagiso Keatimilwe, Mokgweetsi Masisi, Penny Moanakwena, Marianne Nganunu, Rob Stronkhorst.

Co-ordinators of the logistics subcommittees were Til Kreuels, Samson Manchisi, Marianne Nganunu, Eleanor Patterson, Rob Stronkhorst and Otlogetswe Totolo.

Other members of the organising committee were Nigel Hunter, Bill Kelly, Letlotlo Kopong,

Bathusi Letlhare, David Marsland, Esther Moepe, Ismail Morupisi, Daniel Rychner, Stephen Sekhobo, Sandra Shaw, Cornelius Van der Post.

These were assisted behind the scenes by Sally Hughes, Judy Kelly, Bruce McKim, Ester Moepe, Marjo Oosterbaan, Rosemary Rychner and Karin Sollart.

Evening activities

A varied evening programme was arranged which was open on some days to the public. The following are thanked for providing the evening programme:

- Head and staff of the Department of Environmental Science,
- Tshomarelo Puppet Show,
- Reetsenang Drama Group,
- Maru a Pula Marimba Band.

Evening displays

The following organisations, manufacturers, publishers and schools are thanked for their displays:

Boikhutso Primary School
Botswana Bird Club
Botswana Society
Broadhurst Primary School
Camp Primary School
Chobe Wildlife Trust
Forestry Association of Botswana
Heinemann Educational Publishers
International Wilderness Leadership

Foundation, USA
IUCN, the World Conservation Union
Kalahari Conservation Society
Longman Botswana
Macmillan Publishers
Maitlamo Primary School
Metal Box Botswana
Ministry of Agriculture (Range Ecology)
Ministry of Local Government, Lands and Housing (NCS Coordination Agency)
Ministry of Mineral Resources and Water Affairs (Energy Affairs Unit)
National Herbarium
National Museum
Neale Sechele Primary School
North American Association for Environmental Education
Thusano Lefatsheng
UNEP, United Nations Environmental Programme
Wildlife Clubs Association of Botswana
WWF, World Wide Fund for Nature

Venue support

The conference was held at the University of Botswana in the Faculty of Science where the Pre-Entry Science Department provided facilities, secretarial and technical support. Further assistance was given by undergraduate student helpers, The Educational Technology Centre, Feedem Caterers and the Maintenance Department. Additional transport was supplied by the Central Transport Organisation (CTO).

Annex 1

Conference plenary papers

Opening speech

The Honourable D N Magang
Assistant Minister of Finance and Development Planning

Mr Chairman, distinguished delegates and guests, participants, ladies and gentlemen. I wish first of all to welcome you, on behalf of the Government of Botswana, to this important conference on environmental education. Needless to say, our environment today has become a burning issue, both locally and internationally.

The past twenty years has witnessed an awakening to the need to think globally about environmental issues. Ours is a small planet which is being rapidly exploited without any thought of the long term consequences. The publication of the Brundtland Report in 1987 titled "Our Common Future" provided a global agenda for change. It stressed the need for all nations to share the responsibility for the caring of our planet. The report further emphasised the need for economic development of all nations to be based on the concept of sustainability; in other words, in our quest for development, our natural resources should be managed in such a way that future generations can enjoy the same or better quality of life.

Economic development depends to a very large extent on the environment. Unfortunately, we are busy degrading the environment by depleting and polluting its resources. This cannot be allowed to go on for long. It will result in irreversible changes in plant and animal life, leading to extinction of many species. This in turn is likely to lead to starvation and disease, urban migration, social disruption and conflict.

To ensure that development is sustainable, the Brundtland Report outlines an international strategy and urged all countries to adopt their own national strategies. The report emphasises that participation and support of all citizens is crucial in the preservation of our environment. This can only be achieved through education—with a new emphasis on the protection of the environment for future generations.

For many, Botswana seems a very big country with a small population of only 1,3 million. To them, it seems to possess enormous possibilities for development, and environmental problems appear limited or non-existent.

However, the Government of Botswana is,

certainly aware that this is not the case. In the circumstances, the development of a national strategy to achieve sustainable conservation of our environment has been paramount in our development objectives. For instance, in December 1990, the National Conservation Strategy (NCS) was accepted by Government. This NCS is now in the process of being translated into an action plan to be implemented during NDP7.

By adopting its own National Conservation Strategy, the Government has committed itself to several measures aimed at achieving sustainable environmental goals. Environmental education is one such measure and it is essential if the NCS is to succeed. This conference is therefore another milestone on the road to sensitizing the nation and indeed the whole world, to the need for environmental education.

Botswana can justly be proud of the great strides it has made in its educational development since Independence. Through both formal and information education, and with the assistance of numerous NGOs, opportunities have been opened for many to improve themselves. The challenge now is to use this acquired knowledge to protect, rather than destroy our environment. The Ministry of Education in its future programmes will accord environmental education the priority that it deserves. In this regard, the Ministry of Education will educate school children to become aware of their environment to produce the skilled and dedicated citizens who are willing to work individually and collectively towards achieving and maintaining a dynamic equilibrium between quality of life and the environment.

I trust that curriculum developers will continue to make sure that our education is relevant to the everyday needs of our citizens, as well as the well-being of the environment. However, it is clear that environmental education cannot be achieved only through the efforts of the Ministry of Education. It requires the combined efforts of many Governmental and non-Governmental organisations and therefore there is need to coordinate these many efforts. To achieve this, the Ministry of Education, in cooperation with the University of Botswana and the Kala-

hari Conservation Society has organised this conference with the aim of bringing together all parties to initiate the coordination and expansion of environmental education in Botswana.

During this conference, participants will discuss the World Conservation Strategy, the National Conservation Strategy, environmental problems in Botswana and the world in general. The integration of environmental education at all levels of education in Botswana will be reviewed and recommendations for further integration will be made.

Participants from a wide spectrum of organisations in Botswana that already play a role in environmental education have been invited. Resource persons have also been invited both from Botswana and outside, as well as observers from SADC countries.

At this stage, I would like to extend my gratitude to the World Wide Fund for Nature,

the United Nations Environmental Programme and the International Union for the Conservation of Nature (IUCN) for sending personnel, and I should also like to thank participants for gracing this conference with their presence. My appreciation also goes to SIDA, UNESCO and USAID for the financial contribution and to USIS and IUCN for helping to plan and organise this conference.

Looking at the programme, I have little doubt that an exciting and important week lies ahead. It is my hope that at the end of the conference, the deliberations will be translated into concrete recommendations for a plan of action geared towards protecting our environment.

Mr Chairman, distinguished delegates, ladies and gentlemen, I now have the pleasure to declare this National Planning Conference on Environmental Education officially opened.

Global environmental issues

D P Rychner

Director, IUCN Botswana Office

Good afternoon, ladies and gentlemen. I am pleased to be with you here this afternoon, and therefore take this opportunity at the outset to thank the conference organisers for inviting me. The organisation I represent, IUCN, the World Conservation Union, is the largest professional conservation organisation in the world, and has been addressing global environmental issues for over four decades. In my short talk, I hope to give you an insight into some of these issues.

As long ago as the mid 1950s, the first signs of a hole in the ozone layer over Antarctica were recorded. Today, during the 1990s, tropical forests are disappearing by as much as 40 hectares every minute. By 2005, some experts say that the earth will be warmer than it has been at any time in the past 120 000 years. In the oceans, the effects of pollution have not so far been detected on a global scale, but general trends of increasing contamination can be recognized in some areas and these trends are warning signals. Species are disappearing at a rate of 150 per day, some of them as yet unknown to science. These are facts.

Looking back on the history of ecological awareness, one can observe a very important trend away from early initiatives that were taken to protect individual but spectacular species like the American Bison. During this century, and particularly in its second half, all sorts of wider problems have been identified. The response of humanity is still fragmented but has tended to become better organized. Environmentalists are now concerned about all natural resources, but the most important ones are those which form the basis for life: clean air, clean water and biological diversity.

The atmosphere

I would like to look first at the air, or better still, the atmosphere. It allows us to breathe, it protects us from the harmful effects of solar radiation, controls our climate, and is used as a vast highway by both people and wildlife.

Until the seventies, it was a commonly held view that the atmosphere was so voluminous that it had an unlimited capacity to absorb the amount of pollution being injected into it by

our urban and industrial complexes. But research has shown that acidic compounds released into the atmosphere over one nation can precipitate in rain over another nation, thereby causing damage to lakes and forests. In addition, the emission of so-called greenhouse gases, including carbon dioxide (produced mainly through the use of fossil fuels), has resulted in what may be regarded as one of the most important problems mankind has to face today—global warming. Our planet is already committed to climate changes. Each continent has already recorded altered seasons as well as changed patterns of river flow, rainfall, storm intensity and other phenomena. The effects of climate change are likely to impact on the current crisis facing biological diversity. Every country in the world will face major changes in the future, such as increasing desertification, a rise in the sea level or others.

The depletion of the ozone layer is due largely to the injection into the atmosphere of chlorofluorocarbons (CFCs), a family of gases that was invented in 1930; unfortunately, almost all the CFCs that have been released since the 1930s are still in the atmosphere so we can expect to feel their effects for at least several more generations, even if we stopped using them now. Damaging the ozone layer enables higher levels of ultraviolet radiation to reach the planet, thereby causing increased levels of human cancer, eye problems, reduced productivity of plants, and damage to animals in the marine food chain. Unlike drought or other local problems, the impact of a weakened ozone shield will affect all of the world simultaneously.

Clearly, major changes are affecting the atmosphere today. Whether these changes will bring minor discomfort or major tragedy depends on how governments respond.

The oceans

All life on our planet depends on the global circulation of water—the cycle that draws water from the oceans to become clouds of water vapour in the atmosphere which then precipitates as rain over the land and eventually returns via rivers to the sea. The water also cycles vital

nutrients through ecosystems and thus supports a rich variety of terrestrial life. The seas' microscopic plants are thought to produce about one fourth of the world's oxygen. In short, the ocean is a vast, complex system with a fairly delicate balance of variables which enables it to maintain the conditions necessary to support life.

For the first time in history, this balance is under threat from man's activities. As with the atmosphere, the oceans were considered extensive enough to absorb huge quantities of our waste without major negative effects. However man-made chemicals have been detected in the deep ocean, and residues of pesticides used in the northern hemisphere have been found in tissues of organisms as far away as the southern tip of South America. Over-exploitation of living resources and coastal development are additional major factors affecting the ocean.

Antarctica

Antarctica acts as the most important fresh water reservoir in the world with 90 per cent of this water being locked up in the Antarctic icecap. This most remote continent is thus vital to sustaining human life, affecting global climate and determining coastlines throughout the world. If the icecap of Antarctica were to melt the level of the ocean would rise by 50-60 metres. Widely predicted global warming will melt at least part of this icecap, leading to serious impacts on coastlines.

Biological diversity

Species are the building blocks of ecosystems, and ecosystems form the life support system for humans. It is apparent that more effective management of species and habitats will enable societies to adapt more effectively to the resources available in their ecosystems, while producing sufficient surplus to trade for goods and services needed from afar. Biological diversity is now under siege throughout the world. More species than ever before are threatened with extinction, with thousands disappearing each year. Sensitive ecosystems are under increasing pressure from humans. Development tends to emphasize short-term exploitation rather than the long-term, sustainable utilization of natural resources. Over-exploitation of living natural resources is driven primarily by the desire for an immediate financial reward, without considering the legitimate needs of local peoples or future generations. Where significant profit can be made, as in the case of African rhinos, the target species can be devastated with virtually no benefit to local communities.

The state of health or deterioration of the commons (traditional grazing and agricultural

areas) is a measure of humanity's use or mis-use of the world's resources. If the commons are preserved in a healthy state it will be because concern for their health has led to control measures to keep them in that state. If people can develop the technological skills as well as political will needed to safeguard the global commons, it will very likely be an extension of the same will and abilities needed to solve other problems threatening the planet's future.

The point of view that the whole of the biosphere is a "global commons" is consistent with the notion that the earth as a whole functions as a single living unit, even though it has only a thin veneer of living tissue. While the chemical and biological cycles that characterize the planet are known to fluctuate naturally over time, and to an extent resist disturbance, caution is needed to prevent major imbalances or even a collapse of the system. Human use of resources has dramatically altered some of these cycles.

The response of mankind

Since 1972, when planning for the United Nations Conference on the Human Environment started, global environmental issues have been widely discussed. The Stockholm Declaration and conference resolutions constituted, in their way, a strategy for addressing some of the issues. The World Commission on Environment and Development (WCED) was established by the United Nations in 1983 to propose long-term environmental strategies for achieving sustainable development, to recommend ways to promote greater international cooperation in addressing problems relating to environment and development, and to help define a broad consensus on the major issues.

The WCED report, entitled *Our Common Future* was presented to the United Nations General Assembly in October 1987. Simultaneously, the United Nations Environment Programme tabled its *Environmental Perspective to the Year 2000 and Beyond*. These two reports reinforce each other, and build on the philosophy formulated in the 1980 *World Conservation Strategy*.

Both of the 1987 reports paint a frightening picture of the rapid depletion of the world's resources, coupled with rising social and economic problems. They reflect the widespread frustration about the inability of current approaches to solve the inter-linked problems of environment and development and call for major changes in the way people relate to their environment. In presenting the WCED report, the Commission's Chairman, Prime Minister Gro Harlem Brundtland of Norway, issued a challenge to the world:

Teacher and pupils at Maitlamo Primary School, Lobatse exploring the natural world in their school grounds..

"We call for a common endeavour and for new norms of behaviour at all levels and in the interests of all. The changes in attitudes, in social values, and in aspirations that the report urges will depend on vast campaigns of education, debate and public participation.

To this end, we appeal to citizen's groups, to non-governmental organisations, to educational institutions, and to the scientific community. They have all played indispensable roles in the creation of public awareness and political change in the past. They will play a crucial part in putting the world onto sustainable development paths, in laying the groundwork for Our Common Future."

The main message of WCED is that fundamental changes are coming to our planet. These changes—biological, economic, political, social—are all interlinked and their direction is predictable. People can work together to prepare for and where possible modify the changes that will occur, or people can abuse their resources in ways that increase the chances of damage and disruption. The best strategy for the world is to work diligently to build the capacity to direct change and to adapt to it when it comes. Such adaptability will require using the available resources in ways that sustain their long-term productivity.

Sustainable development is a process which enables harmonious human relationships with natural resources to endure over time, and to adapt to changing conditions. By its nature, it imposes limits, seeking a balance which is within the resilience of a system, consistent with social values and institutions, and based on local participation in the development process.

Slowly, governments are accepting the wisdom of the late Indian Prime Minister Nehru's comment that "the alternative to co-existence is co-destruction". Governments are slowly beginning to act together. For example, one year ago, nearly one hundred developed and developing countries amended and strengthened the Montreal Protocol, by agreeing to the virtual elimination of CFCs and other ozone-destroying chemicals. For the first time ever, governments agreed to establish a Multilateral Fund of US\$240 million over three years, designed to provide new and additional resources to facilitate technology transfer, and to ensure that developing countries—those least responsible for global pollution—become full partners in defining and implementing solutions.

Progress is likewise underway by the World



Bank, UNDP and UNEP in establishing a Global Environmental Facility of US\$1.3 billion, to address ozone layer depletion, climate change, erosion of biological diversity and the protection of international fresh and marine waters. These are promising starts. But mankind must go much further in reaching binding international commitments that include additional financing and technology transfer. These twin issues loomed large in the first session of negotiations leading to an international legal instrument on biological diversity. IUCN has been preparing the draft Convention for four years now. Many people are frustrated that progress has been so slow, while species extinction rates have risen so quickly.

However, few could have anticipated the complex issues before the negotiators. They include the need for increased scientific research and training in tropical and humid countries and additional financing to protect genetic diversity, to provide free access to genetic resources, and to provide fair compensation to "gene-rich" tropical countries and "technology-rich" industrialized countries.

Success in global conservation must combine *in situ* conservation strategies. Natural reserves and protected areas for wildlife are in themselves impotent in defending species against acid rain,

soil erosion and the loss of wetlands, coral reefs and other habitats from human activity. In the run-up to the 1992 United Nations Conference on Environment and Development, progress towards agreement on the two mutually reinforcing treaties on climate change and biological diversity will test the collective commitment to save the planet. Legally binding, action-oriented protocols to give teeth to these conventions, will be developed.

Slowly, a new imperative is emerging in which resources are being channeled to meet basic human needs, to fight poverty, to increase access to jobs, health care and education, and to engage the traditions and skills of the people—particularly women—in development. Poverty and environmental degradation are mutually reinforcing. Conservation cannot succeed when over one billion people are too worried about their next meal or tonight's fuelwood to be concerned about inter-generational responsibility. Environmental protection cannot be implemented without successfully accelerating sustainable development and strengthening sustainable livelihoods.

Progress likewise demands that developed countries reform wasteful consumer and other destructive habits, turn from polluting to

cleaner technologies, and revamp the economic values attached to natural resources. Economics has consistently undervalued or ignored natural resources, thereby beckoning individuals, industries and governments to exploit them as if they were free and infinite resources. Clearly, standing forests, wild species, virgin soils and precious clean air and fresh water have life-sustaining and photosynthetic values that must be incorporated into Gross National Product and other measurements. The World is looking to the Second World Conservation Strategy to help integrate ecology with economy and development in an operative manner. Caring for the Earth, a strategy for sustainable living, will be launched worldwide on the 21st of October 1991. It is the result of a close cooperation between IUCN, UNEP and WWF. On the 21st of October, key politicians and conservation organisations throughout the world will come together and underline their willingness to implement this new tool.

Let us work together on this new task.

Environmental issues in Botswana: problems and opportunities

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Introduction

Although Botswana is party to the many environmental problems that beset the world in the closing decade of the twentieth century, there are some which are of more immediate concern than others. Much has been written on environmental issues in Botswana during the past decade (for example, Botswana Society, 1984, 1986; Arntzen and Veenendal, 1986; Cooke and Silitshena, 1986; IUCN 1990; Thomas and Shaw, 1991); far more, in fact, than can be covered in this short discourse. The aim, therefore, is to summarise and simplify the main issues, explain how they have arisen in the past, and where they are likely to lead to in the future. On the strength of the maxim that "those who forget the past will be condemned to repeat it" the emphasis has been placed on the historical aspects. The understanding of the underlying causes of environmental problems is the first step to solving them, a process in which environmental education, the theme of this conference, has a major role to play.

Environmental hazards and constraints in Botswana

We are fortunate that there are few natural hazards in Botswana. Volcanic activity ceased some 70 million years ago, leaving a legacy of diamond wealth, and although earthquakes are common in Ngamiland they leave little damage; the largest recorded at Richter scale 6.7, in 1952, merely caused the collapse of a couple of huts in Maun. Flooding occurs sporadically, causing disruption of communications, as in eastern Botswana in 1988, or loss of life, as in the Kolobeng River in March this year, but is not on the same scale as the impact of cyclone Domoina on Mozambique and Swaziland in 1984, which left over 10 000 dead and 100 000 homeless.

Far more important are the limitations imposed by the environment, particularly those of poor soils, high temperatures, erratic rainfall and lack of surface water. Drought is endemic, with a statistical probability of severe drought occurring every 5 to 7 years in many parts of the country, and partial drought every two years

(Pike, 1971; Sandford, 1978). Drought should be considered a limitation rather than a hazard; the biota of the region is adapted to drought conditions, as have human groups been in the past. Environmental constraints have been a major factor in the history of development in Botswana, from the Stone Age through to current industrialisation. It is when these constraints are ignored, or when the technologies of exploitation outstrip the capacity of the environment to provide, that environmental problems occur.

Environmental issues in Botswana can be divided into those arising in rural areas from pressure on resources, and more recent problems arising from "development", mostly in urban areas. Both are man-induced.

A history of environmental issues

The environment consists of ecosystems which vary in productivity through time, both seasonally, and on longer time scales, such as the drought cycle (Tyson, 1986). Human development relies on the exploitation of these ecosystems using available technology; in turn the patterns of use become incorporated into the culture and traditional beliefs of the peoples concerned.

The history of mankind shows that technologies of exploitation have become more sophisticated, and progressively less reliant upon the environment. Technological improvement, whether it be the invention of the wheel or the use of telecommunications satellites, has immediate positive impacts for the society concerned, and becomes widely adopted. Frequently, however, negative impacts may follow. There is no better example than the motor car, hailed as a harbinger of personal freedom in the early decades of the century, and now recognised a global environmental problem. As technology develops by a series of distinct steps, the understanding of the implications of the advance, and its assimilation into the cultural milieu follows years or even generations later.

In Botswana the small populations and long period of technological conservatism represented by the Stone Age and Iron Age led to an equilibrium between society and environment,

although resource problems may have occurred as early as the 13th century (Campbell, 1982). By the first decades of the 19th century, with large migrations of Tswana groups into the region during the Difaquane, environmental conflicts still seemed to have been minimal, with the presence of strong, centralised tribal authority and the adoption of arable and pastoral strategies suited to environmental limitations. A list of the principal attributes of these societies is given as Table 1. These attributes are important, for they form the basis of current perceptions of the environment amongst Batswana. The tribal authority has been largely superseded by other forms of administration, with a consequent weakening of the environmental monitoring and control that was inherent in the authority of the *dikgosi* (Hitchcock, 1985). The five remaining attributes have been largely overtaken by the developments that have occurred in the past 150 years, based mostly upon the technological innovations listed in Table 2.

The effects of these impacts have been described in detail elsewhere (Campbell and Child, 1972; Campbell, 1991; Thomas and Shaw, 1991). In the 19th century, human influence spread to the most remote corners of the coun-

Table 2 Technologies with a major impact on the Botswana environment since 1800

Technology	Impact
ox-drawn plough	extension of agriculture to hardveld
horse/firearms/ox-wagon	trade, decimation of mammal herds outside tsetse fly areas
internal combustion engine (vehicle) (pumps)	access and movement of commodities exploitation of water resources
veterinary health programmes medical health programmes	expansion of national herd change in demographic characteristics
wire fencing	reduction of free range

Table 1 Attributes of late Iron Age societies in Botswana

Centralised tribal authority, including the monitoring of grazing and water resources through tribal structures

Large families to counteract high infant mortality, and to provide labour and defence

Perception of unlimited land

Free wildlife and vegetation resources under the control of *dikgosi*

Opportunist subsistence agriculture based on drought resistant species and staggered planting/harvesting

Drought strategy pastoralism based on maximum cattle herds, transhumance and the *mafisa* system of cattle tenure

try; trade in wildlife products, and to a certain extent, cattle, spread, large mammals were eliminated over much of the region, and depletion of surface water supplies occurred. After the brief respite offered by the rinderpest epizootic in the 1890s, expansion and change has occurred at an ever increasing rate. Rural health programmes have encouraged a tenfold increase in population from 120 000 in 1904 to the present estimate of 1.3 million. Borehole technology, supported by veterinary medicine, has allowed the expansion of livestock into areas hitherto occupied by wildlife, whilst fencing has permitted the division of the land into a series of large paddocks. In the past twenty years the exploitation of minerals has provided resources and income for the industrial and commercial development of urban centres. Inevitably these developments have brought conflicts of interest over resources and land use: within the past decade there has been a growing realisation that some of Botswana's development is not sustainable in the long term. The National Conservation Strategy, discussed separately in this conference, is the result of seven years of deliberations by government and non-government organisations on the question of a sustainable future.

Population and environmental problems

Figure 2 shows the basic relationship between population and resources. Essentially human groups consume the available resources and produce waste, which, in an ideal situation, would be recycled back to the resource base. Sustainable use of resources is quite simply the consumption at or below the level at which the resources regenerate.

If the population increases rapidly in numbers, then there is increasing competition for finite resources, a situation which leads inevitably to the Poverty Cycle, with the accompanying miseries of famine, disease and resource destruction so apparent in many parts of Africa. Alternatively there can be increased consumption of resources per capita, a characteristic of economic development. Although quality of life improves with development, the cost in resources is high, particularly in terms of dealing with waste.

In practice Botswana is dealing with both problems simultaneously. The population is growing at 3,7% per annum, with 50% of the population below the age of 15, and therefore requiring massive infrastructural investment for little economic return. Improvements in health care and life expectancy have long made obsolete the need for large families, and the notion, prevalent in many developing countries, that "a populous nation is a mighty nation" has shown to be untenable in the face of current ecological realities. The adoption of a Population Policy in Botswana will be a major step in the long-term drive to sustainability. Without it the desired goals will be difficult, if not impossible, to attain.

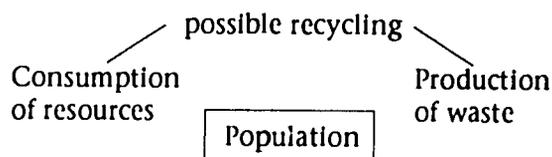
Problems related to pressure on resources

A major set of problems relate to increasing pressure on land, water, vegetation and wildlife resources, and it is pertinent to make some comment on these in passing. All of these problems arise quite simply because our techniques of exploitation have improved. In the case of the cattle industry, as Cooke (1991) has recently remarked, problems have arisen quite simply because livestock numbers increase in the absence of natural controls, and the traditional management system has not been modified to restore the balance. The problems of the cattle industry have been well documented (Hitchcock, 1985; Yeager, 1989) and well publicised, and includes overstocking, range degradation, competition with wildlife resources, uncontrolled expansion of boreholes, low levels of productivity, inequity of cattle ownership (60% of cattle are owned by 5% of the population, with 45% of rural dwellers having no

Figure 1 Linkages between environment, technology and social response

Environment	Technology	Social Response
limitations	immediate positive impact	perception
variation	possible longterm negative impacts	culture/activity activity

Figure 2 Relationship between population and resources



- Consumption at or below renewable levels is considered to be Sustainable Development
- Increased consumption (depletion of resources) arises from an increase in population, that is the poverty cycle, and/or the increased consumption per capita which is development.

Table 3 Factors favouring environmental conservation in Botswana

- small population
- economic viability
- democratic tradition
- late industrialisation
- government awareness

access to livestock at all), abuse of the traditional grazing system by the application of dual grazing rights under TGLP, and high levels of owner absenteeism under the *mafisa* tenure system. The national herd has again risen to 3 million in 1991 after a loss of 500 000 beasts in the 1984/5 drought, and further losses, accompanied by serious environmental consequences, are inevitable as soon as the climate once again fails us.

The environmental answers are fairly straightforward: cattle numbers must be limited to the carrying capacity of the range, probably at around 2-2,5 million, and, on the grounds that poverty is the driving force behind environmental degradation, the benefits of the cattle industry must be more equally distributed in rural society. Politically the answer is difficult to accept as cattle wealth is important for social as well as economic reasons and 70% of the population live near the poverty line. Yeager (1989), in his analysis of the Botswana cattle industry, has pointed out that politicians in a democratic society are unlikely to press for environmentally sound, but culturally unpopular policies if it means losing their jobs, and here the matter rests. Both the Ministry of Agriculture Policy Paper (MOA, 1990) and the NCS (GOB, 1990) recognise the magnitude of the problem, but stop short of stating the nature of the medicine. For the time being the government is adopting a soft approach. For example, in the Daily News of 3rd July, 1991, the Honourable Mr Morake M.P. appealed for a reduction in herd size to conserve the environment, while Mr David Finlay, Managing Director of the Botswana Meat Commission outlined proposals for a review of the pricing formula to increase offtake of beasts in the prime 2-2,5 year age range.

The problems in the arable sector are less well known and far less soluble. The problem here is to take a flexible but low productivity subsistence system and to turn it into a modern farming system with assured yields, the so-called Food Security of the Agricultural Policy. The difficulty of the task can be seen from the results of the Accelerated Rainfed Agricultural Programme (ARAP), which cost an estimated P 100 million between 1985 and 1990 (MOA, 1990), yet with the exception of the good climatic year 1987/88, resulted in some of the lowest yields since Independence.

There has been an increasing tendency over the last few years to seek the answers to agricultural productivity in sophisticated large scale dryland or irrigated projects. Given the physical and managerial constraints these are likely, not only to fail, but also to lead to serious environmental consequences, as well illustrated by the Pandamatenga schemes of the 1950's and 1980's. The idea currently circulating that the

ecologically unique Pandamatenga Northern Plain be given over to farmland is one that should be strongly resisted.

Other resource shortages have a more cheerful prospect, in that the problems, however serious, are well known and are being actively addressed. In this category we have a renewed interest in wildlife utilisation as an alternative use of range land, with recent publication of the Wildlife Utilisation Policy and the Tourism Policy. The regeneration of wildlife utilisation has also led to a major revision of the demarcation and use of Controlled Hunting Areas, and will eventually lead to a review of the whole system of land tenure. Hydrological resources have been assessed in the National Master Water Plan. The serious problems of woodland and veldproduct depletion have been highlighted by NGOs, and are addressed in the NCS. What is now required is sufficient investment and political willpower to implement the policies.

The problems of development

Botswana has had one major advantage in its recent industrialisation—development has come late, and there has been ample opportunity to learn from the mistakes of others. Unfortunately, the opportunity has not been taken, and it is probable that over the next twenty years environmental problems resulting from development will assume alarming proportions. The problems are manifold and are best illustrated by selected examples.

The most obvious to the public is the question of litter. It is natural for humans to discard objects which have no value; without this trait there would be no science of archaeology. Again the shift in technology is important; a thousand years of discarding clay pots has left far less impact on the landscape than a decade of aluminum cans. This particular item has become the totem of anti-litter campaigns, and it is important to understand the magnitude of the problem, as it equally applies to other objects, such as polythene bags, paper and tyres which we do not recycle. Every year the company which produces beverages in Botswana imports 200 million cans to hold the 50 million litres of beer and 30 million litres of soft drinks produced. Currently about 10% of these containers are recovered for recycling, and the rest are discarded. For those who collect odd statistics, we throw away enough cans, laid end to end, to stretch from Gaborone to Francistown every week.

Sadly Botswana is acquiring a reputation for this form of pollution, which is unnecessary. Many poorer countries in Africa, for economic reasons, make the container returnable, and the problem disappears. Most western countries

Solid waste disposal is one of Gaborone's major pollution problems.

combat the menace by legislation and economic incentive. In Botswana, we do nothing. Culpability must rest on those who put financial profit before environmental cost, and on those who, through inaction, fail to pursue the many remedial options open.

On a larger scale Botswana has failed to come to terms with the burgeoning problem of domestic and industrial waste disposal (Segosebe and Van Der Post, 1990). Good waste management is expensive, and so far, investment has been limited. A prime example of the waste hazard can be seen at the Gaborone City dump, where an unsealed landfill site, lying between a residential suburb and the city's water supply, is subject to both uncontrolled dumping and burning of waste, some of which is toxic.

Another aspect of the negative impacts of development can be seen on the roads of towns. The government has made commendable investment on transport infrastructure in rural areas, and has actively promoted car ownership through vehicle loans, cheap petrol and low road tax. The result has been a massive increase in vehicles in urban areas where road infrastructure is inadequate. A quick survey of number plates will reveal that over 40 000 vehicles have been registered in Gaborone alone during the past seven years, and at the predicted rate of urban growth, the roads of the city will resemble those of Cairo or Lagos within the decade. Investment in alternative forms of public and private transport should be a national priority.

Opportunities and advantages in conservation

Botswana is not alone in trying to come to terms with the environmental consequences of the last two or three hundred years. It does, however, have significant advantages over many countries, which are shown in Table 3. Some of these have already been alluded to. The small population and economic viability means that it does not have the crushing burden of poverty that is found for example, in Sahellian Africa, where economic, demographic and environmental problems are proving almost impossible to solve. The negative impacts of rapid development are just beginning to sink in, but Botswana is not dealing with the massive pollution problems of, say, eastern Europe. The government has become increasingly aware of environmental issues during the past decade, and although a democratic tradition can be a rather ambivalent factor, policies directed towards sustainable



development are now being formulated. Whether the government will have the political will to implement these policies fully remains to be seen, and it is here that interaction with an informed, environmentally aware public is essential.

The greatest advantage Botswana possesses is a combination of these factors, which has given it the luxury of a breathing space in which to map out the future. Whilst there is economic growth and a small population, that space exists—but it may not last long, and changes in the environment are occurring at an ever increasing rate.

Environmental education is now a necessity, and the importance of the present school generation as a target must be stressed. By the time the current cohort of seven year olds leaves primary education, the population of Botswana will have reached 2 million.

The role of environmental education

Many of the adjustments necessary on the path to sustainability can be achieved through the enforcement of appropriate legislation, through careful planning, and by the application of fiscal benefits and penalties.

Above all, however, environmental education is essential at all levels of society. This was stated

some years ago in a Botswana Society publication, *Developing Our Environmental Strategy* (1986:17):

"Much of the misuse and abuse of national resources of grazing land, soil, and water is due to the continued prevalence of out-of-date traditional attitudes to cattle and cattle ownership, and to ignorance of basic causes of overgrazing and land degradation. The dire threat to basic natural resources and to future environmental integrity is thus unappreciated by large sections of the population.

There is a great urgency in changing these out-of-date attitudes and in educating the population at large. This can only be done through effective popular education at all levels..."

This statement is not entirely correct, in that research amongst rural people (for example, Fortmann, 1989) has frequently shown that they have a high awareness of the causes and processes of resource degradation, and their belief is that official prescriptions are the cause of problems.

Environmental education must therefore have several aims. First, should be the dissemination of environmental knowledge and values to the whole spectrum of age groups, to promote awareness and understanding of environmental issues. By extension it must contribute to the fine-tuning of the less appropriate cultural perceptions. Beyond these basics it should inculcate into all citizens a sense of responsibility for their actions, and those of the society in which they live. In this way they can actively participate in the decisions which influence their environment, exerting pressure upon the decision makers if necessary. The recent furore over the Boro dredging has shown that, whatever the rights and wrongs of the particular issue, a united voice can influence decisions made from above.

In other words a National Conservation Strategy in government is not enough, it requires awareness and active participation at every level in society.

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Environmental Activities in Botswana

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Introduction

The subject of this paper is a discussion of current Government activities relating to natural resources conservation and environmental protection. We will discuss some of the environmental problems which Botswana presently experiences and the commendable efforts which are being undertaken by some Government departments. The role of the Natural Resources Board will also be related to these efforts.

Environmental issues

It is difficult to discuss current activities without first establishing the context within which they are taking place. The problems leading to the formulation of the National Conservation Strategy have been discussed extensively over the last few years and will again be elaborated at this conference. Consequently, for the purpose of this discussion, I shall refer to them only briefly in order to set our main subject in context. These problems relate to: water resources, rangeland, wood resources, veld products, wildlife, pollution and population.

The use of water has increased significantly over the last few years. The main contributory factors have been growing human and livestock populations. There are two key concerns which relate to water resources, namely pressure on supply and pollution. Rapid demand has resulted from population growth, urbanisation, and industrialisation. Pollution results largely from ground water contamination near large settlements. Another concern relating to water is the mismatch between demand and supply areas which is likely to make the procurement of future water supplies very costly. Most of the resources are in the north of the country while much of the demand is in the south. Other issues relate to the unknown quality and quantity of ground water as well as recharge rates.

Land degradation has resulted largely from the increase in the livestock population. The results of the process include reductions in the quantity and quality of grasses, changes in the condition of surface soil, the establishment of inferior plant species and the erosion of soil. Other questions concerning rangeland relate to

whether the land tenure system, dual grazing rights, and the availability of cheap water to borehole users contribute to overgrazing.

The shortage of wood is most acute around the urban areas and the major villages where demand is greatest. The decline in the amount of rainfall in the past years has aggravated the problem. Wood resources are under pressure from various uses such as fuel and building materials. The main concern relating to the depletion of wood in the urban areas is cost while in the rural areas it is distance from sources and the time involved in collecting wood. In addition, there are the environmental effects of wood depletion which occur in conjunction with overgrazing.

Veld products are important because of their commercial and subsistence contribution. The exact extent of their depletion is difficult to quantify, but depletion takes place at national and regional levels and affects resources such as thatching grass, mokola palm, and the grapple plant. The main constraints to the full utilisation of veld products include infrastructural and marketing problems.

Although the country sustains large numbers of wildlife, there is concern over declining populations in many areas. It is however unclear whether decline is primarily attributable to the veterinary fences which have been constructed to control livestock diseases or to other factors such as shortage of grazing and poaching. There is concern over the declining wildlife populations since this could jeopardise the opportunity to fully utilise this resource.

In addition to the destabilising effect of resource over-exploitation, pollution may reduce the productivity of ecosystems. This threat is relatively minor in Botswana, but it is one which we ought to begin to address before it gets out of control. Pollution affects the quality of air, water, and soil. As far as it is known, pollution is limited to Selebi-Phikwe (air pollution), around large settlements (ground water pollution), and to some industries such as tanneries and mineral workings. It is also evident around settlements in the form of littering and indiscriminate dumping.

The last of the major environmental issues is population. Among the most important features of the population of Botswana are its very rapid growth, very young composition, unbalanced sex structure and uneven spatial distribution. The national rate of growth averages about 3,5 percent per annum. The population structure has in-built growth momentum because of the large numbers of females. Therefore, even if each female has few children, the growth would still be substantial. The concurrent decline in mortality, especially of infants, has made the age composition of the population increasingly younger. This youth not only has important implications for the future demand of resources, but also means that the population will grow under its own momentum for a long time, because of the large number of potential child bearers.

Together with this process of rejuvenation, a spatial shift of the population has occurred from rural areas to the major villages and urban areas. Soon the urban population is expected to account for about 32 percent of the national population. Despite strong urbanisation trends, about 85 percent of the population is essentially rural and continues to place great demand on agricultural and wood resources. While the absolute growth of the population has had an adverse effect on the state of natural resources, the problem emanates less from that fact and more from the rural character of the population and the resource needs which that character implies. The problems caused by an expanding population are central to the National Conservation Strategy and to national development in general. Resource imbalances are likely to occur if population pressure continues.

Environmental principles of note

Because of the complexity and interrelatedness of the preceding problems, Government has prepared a conservation strategy designed to address them. The main assumption underlying the conservation strategy is the principle of sustainable development. In general terms, the principle implies that our generation should use no more than the annual yield of renewable resources so that future generations may have access to capital stocks of natural resources similar to those currently available.

A closely related concept is that of carrying capacity which is the maximum rate of resource consumption and waste discharge that can be sustained indefinitely without impairing ecological productivity. In simple terms, the idea means that there is a limit to the rate of resource use and waste production that can take place without reducing both the stock of natural capital and the rate at which it can regenerate.

It ought to be noted though that while our society depends on the many ecological resources already referred to for survival, at the national level, carrying capacity is ultimately determined by the single vital resource in least supply. For example, although we might have a number of resources such as grazing, wildlife, and water, the shortage of only one of them is sufficient to drastically affect our livelihood. The principle of sustainable development also suggests that the maintenance of equity between generations and social groups, self determination, and participation are important ways of ensuring that development is attained. This is because people only participate in conservation if they are part of the process and gain from it.

The preceding ideas are very relevant to us. The use of natural resources is growing and with regard to some of the resources such as water, grazing and wildlife, there is concern in some areas that we may be exceeding sustainable rates of use. Such overuse may lead to the depletion of resources and to the reduction of species. In the long term, this could lead to the destruction and extinction of complete ecosystems and may ultimately undermine the ability of the ecosphere to produce the type of environment necessary to sustain current living standards.

In Botswana, sustainable development is to be attained through a number of development and conservation goals. The development goals are:

- the development of new and better natural resource uses which are sustainable
- the optimisation of the existing uses which are made of all natural resources;
- the development of multiple as opposed to single purpose, natural resource uses;
- diversification in order to create jobs;
- increased education and participation by all members of the society in improving the environment;
- the development of links with neighbouring countries in conserving resources;
- the establishment of a balance between population growth and the supply of natural resources.

The conservation goals are:

- the conservation of main ecosystems, wildlife and cultural resources;
- the protection of endangered species
- the maintenance of stocks of renewable resources while increasing their sustainable yields;
- the use of exhaustible resources at optimal rates;
- the distribution of incomes and rewards more

equitably in the interest of conserving natural resources;

- the restoration of renewable natural resources;
- the prevention and control of pollution.

Institutional provisions

The magnitude of our environmental problems and the goals we seek to achieve have justified the introduction of new institutions to implement the strategy. Government is now in the process of establishing a Natural Resources Board and its Secretariat. Its major responsibilities will be:

- to develop and coordinate environmental policy matters within Government
- to establish an effective chain of implementation from central Government to village level;
- to encourage natural resources development initiatives at all levels.

The Natural Resources Board will not take away the existing functions of the various Government bodies. The task of the Agency will be to advise, coordinate, monitor, and cooperate with Government institutions. However, in addition, it will take initiatives currently not addressed such as environmental awareness building, the preparation of environmental impact statements and State of the Environment reports.

Another decision relating to conservation institutions which will be made in due course relates to the membership of the NCS Advisory Board. Its main responsibility will be to cooperate with Government and non-governmental institutions in the interest of ensuring that the intentions of Government concerning environmental conservation and improvement are achieved. The Board will have wide representation, possibly including central government institutions, the private sector, parastatals, local authorities, and non-governmental organisations.

Legislation establishing both the Board and its secretariat will be prepared. The main purpose of the legislation will be to define the duties and functions of the secretariat and the Board, as well as their relationships with each other, and with other Government institutions. The final institutional change will be the appointment of environmental liaison officers in Government ministries whose main task will be to ensure that policies of their respective ministers are in accordance with the requirements of the National Conservation Strategy.

National Conservation Strategy projects

A number of projects to be implemented under the NCS have been formulated. Through the implementation of such projects covering the forestry sector, veld products, wildlife and national parks, and land rehabilitation, as well as through the use of seminars, a number of benefits which fall into three categories—namely conservation, environment/development and community benefits—are envisaged.

The expected conservation benefits include reductions in loss of natural areas; increase in the numbers of endangered wildlife species, the restoration of degraded rangelands and eroded areas and the protection of natural and cultural areas of outstanding beauty. A number of projects covering wildlife utilisation, land rehabilitation, and reforestation are also envisaged and their specific locations will be determined.

Economic diversification which is expected to result from the implementation of the strategy will help enhance both the economic and physical environments. The NCS seeks to generate new industries and investment opportunities. Both rural and urban communities are expected to benefit economically. Community participation in the implementation of projects is regarded as essential to the NCS's success and will be encouraged.

Education, persuasion and consultation were central to the preparation of the National Conservation Strategy and will continue to be important during its implementation. There has been a lot of discussion of environmental issues over the last five years and this has helped raise awareness. However, public awareness about the importance of sustainable development through annual environmental award schemes and other programmes will be encouraged.

Such schemes will have wide coverage in villages, urban settlements, schools and youth clubs. It is the view of the conservation strategy that education must involve the youth, public servants, political leaders and all strata of society. In order to achieve this, a number of activities for both formal and non formal education are envisaged. It is expected that such activities will include radio plays, the use of popular theatre, as well as tree planting competitions to encourage participation. It is our view that no conservation effort is sustainable if the awareness programme is either lacking or inadequate.

Environmental activities by other departments

In addition to the activities resulting directly from the NCS, important developments which have taken place through the Initiative of other government departments include the formulation of policies on tourism, agriculture, and

wildlife, as well as initiatives in forestry and sanitation. These policies will be supported and encouraged by the Natural Resources Board.

First, the 1990 policy on agriculture has been developed as a result of the poor performance of the sector in terms of both productivity and ecological sustainability. Agriculture policy now seeks to increase productivity with minimum adverse effects on natural resources and the environment. In order to implement the policy, an assessment of land suitability and monitoring of range conditions will be carried out to prevent degradation of land resources that can result from unsustainable agricultural management practices. To date some soil mapping has been done. In addition, fencing in the communal areas has been agreed upon to improve livestock management. The exclusive use of land by individuals and groups is expected to improve the use of range resources.

Second, the wildlife conservation policy seeks to realise the full benefits of wildlife by conserving wildlife as a resource and by developing a commercial wildlife industry thus creating employment. The policy on tourism too seeks to generate employment and raise rural income. Both policies recognise that the sustainability of conservation depends on economic development and improvement in the lives of people.

Third, a programme to strengthen the capacity of the Agricultural Resources Board to prevent and control bush fires more effectively through a network of firebreaks commenced in 1990. The establishment of fire control units covering the whole country is now taking place.

Fourth, a Forestry Development programme has been proposed to address problems of fuelwood scarcity, widespread deforestation and land degradation. A forest inventory programme is already underway and will form the basis of a management plan for the Chobe forests. In addition, land has been secured in

some districts for use in the expansion of nurseries and woodlots.

Finally, the problem of inadequate sanitation is being addressed through the Accelerated Land Servicing Programme. It is felt that the high population densities achieved in the Self Help Housing Areas makes pit latrines unsuitable on health and environmental grounds. For both health and environmental reasons, the provision of sewerage and on-plot water will be extended to all types of residential plots in the urban areas. In the rural areas, the sanitation programme involves the provision of improved pit latrines through a subsidised self help scheme. The objective is to reduce the incidence of diseases as well as to support wider primary health care and environmental protection programmes. It is expected that access to basic sanitation in rural areas will be increased from the current estimate of one quarter of households. Greater attention will be placed on health education and social mobilisation in order to encourage people to help themselves.

The interface between conservation of the natural resources of Botswana and the executive responsibilities of the line ministries and departments is self-evident. The need for cooperation cannot be sufficiently underscored. In this context, the need for awareness building is crucial. That activity will be fostered by the Natural Resources Board in Government in order to engender a profound awareness and willingness to marry conservation and development in our efforts at a rising the standard of life of our people. We must spare no institution, no person, no organisation in our drive to raise awareness so that our policy formulation, project development and the use of our natural resources should be environment friendly. Environmental hooliganism should be undercut through awareness building.

Thank you, Pula.

Environment and development

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I have been asked to speak to you about environment and development. As an environmental land use planner, I am glad to talk about this topic and to share with you both my understanding and my concerns about the environment as it affects development and is affected by development.

At the outset I would like to say that it is not my intent here to criticize the Government of Botswana. If I were to level criticism at particular governments, it would be at the governments of the developed world, whatever that term "developed" means. It is the governments of developed economies—the economies of the West or the North, however one wants to geographically locate and label them—who have created the models of development that stress high consumption and environmental disregard and who have peddled these models across the globe as gospel. It is these development models—the same ones that their salesmen apply at home to the detriment of the environment—that have convinced everyone in the world that more is better and if more isn't better, then bigger certainly is. And it is in our relentless quest for more and bigger that we have reached or are over-reaching the limits of the environment. We in the developed world have consistently and callously ignored the environment for most of the history of our development activities, initially because we just didn't know any better and more recently because we thought we couldn't afford the luxury of considering the environment in our economic decisions. After all, what did it matter that the skies in our cities were no longer blue or that we couldn't swim in some of our streams and rivers because of the filth? We thought that the winds would move out the air pollution from the cities and the rains would wash away the chemicals in our waters.

Let me add here that I am really uncomfortable using the descriptors "developed" and "developing" because the former implies that North America, Europe and parts of Asia have reached that point where the needs and desires of their citizenry have been equally and equitably met, by achieving a fully developed society

and economy, a state of mind and body that just isn't so. If more and bigger were valid indicators of perfected development, would the rates of drug use and crime in these societies be so high and climbing? I think not. The consideration of environment in the development of natural resources can no longer be regarded as a discretionary exercise when their exploitation is being planned and managed. The consequences of environmental disregard are all too evident: air pollution choking our cities; surface water supplies carrying harmful chemicals or valuable soil from denuded lands to oceans and estuaries that can no longer assimilate the wastes and sediments; an atmosphere perhaps irreversibly altered by man's earthly activities. The list is long. The adverse effects of environmental mismanagement on the health and well-being of man and other living species are well documented.

A recent issue of Newsweek, an American publication, touts the invention of an anti-pollution mask that makes the smoggy air more breathable in Los Angeles and Mexico City, for example. It only costs \$8.00, is comfortable to wear, and can be used for eight to ten days (Ernsberger, Jr., 1991). Whoever said that technology cannot provide us with ready solutions to the mess we are making of this planet?

A nasty disease known as Parkinson's Disease—an affliction that slowly destroys the brain—has been linked to groundwater contaminated with fertilizer and pesticide residues (Cowley and Crandall 1990, 44). Fertilizers and pesticides are part and parcel of modern agriculture, mostly because we persist in overusing our soils by continual ploughing and by further abusing them with heavy applications of chemicals—fertilizers, pesticides, herbicides, fungicides, rodenticides, to name the most popular "icides". We must rely on fertilizers and pesticides to compensate for the annual 24 billion tons of topsoil lost globally from erosion (Brown 1990, 3) and to maintain high production levels, so their continued use is probable and their increased appearance in groundwater resources very likely. There may be a concomi-

tant rise in the frequency of Parkinson's Disease, across the globe wherever modern production techniques replace less capital-intensive forms of agriculture.

We know that our atmosphere performs several important functions, one of which is to keep planet Earth at a temperature capable of supporting life. Without the optimal mantle of gases that surround our planet, too much of the sun's radiation might be trapped as it is on Venus, or too much of the sun's heat energy might escape back into space as it does on Mars. The Earth's atmosphere regulates this energy-exchange process by allowing some of the sun's radiation to move back into space and by trapping some of it, thereby keeping the Earth's temperature neither too hot nor too cold. This natural process, known as the "greenhouse effect" is governed by the composition of gases in the atmosphere. We know that the composition of our atmosphere is changing: measurable increases in carbon dioxide, methane, nitrous oxide, and ozone have occurred since the industrial revolution. With this change in the gaseous composition of the atmosphere and the addition of new ones—namely, chlorofluorocarbons (CFCs)—the natural dynamic of the greenhouse effect is changing. The Earth is warming; it has "warmed by more than half a degree centigrade (0.5°C) since the mid-1800s" (Boyle and Ardill 1989, 9). Current projections are for "an increase in global mean temperatures of 4°C by the year 2030 (Gribbin, 1990, 133).

The implications of this warming trend are the subject for many recent books. I leave you to pick out one to read. But as one imminent oceanographer remarked in 1957 at the time that the build-up of carbon dioxide in the air was first suspected: "human beings are now carrying out a large-scale geophysical experiment" (Gribbin, 1990, 91), and one with an outcome that is difficult to predict.

One of the culprit gases and the one that we hear the most about in global warming is carbon dioxide. The emissions from the cars we drive and the industries we build—the underpinnings of economic development—are overloading the atmosphere with carbon dioxide. We know what we have to do—we must reduce carbon dioxide emissions immediately by reducing our combustion of fossil fuels. We must replant our depleted forests to restore the carbon balance. But I drove my car here today; I suspect that most people in this room drove here today. We know the problems; we know the solutions. The problem is one of learning new behaviors, of modifying old patterns to fit new circumstances. This is the real challenge of environmental education and the true test of how successful we are as environmental educators.

To better understand the words "environment" and "development" in the context used here, definitions are useful. I will make use of the definitions contained in a publication entitled 'Environment and Development', by Peter Bartelmus.

Environment is defined by Bartelmus as "the external conditions and influences affecting the life and development of organisms", a definition that includes man and the multitude of other life forms that inhabit this planet (Bartelmus 1986, 1). These external conditions and influences emanate from earth's lithosphere, hydrosphere and atmosphere, all of which make up the biosphere where life can exist.

Let me define these terms so that a common understanding can be shared. The lithosphere is composed of the rocks, sediments, mantle and core of the earth; the hydrosphere is made up of its oceans, lakes, rivers, icecaps and other water bodies; and finally, the atmosphere, the gaseous mantle surrounding the earth that was mentioned earlier in the discussion of global warming (Bartelmus 1986, 1; Odum 1975, 4).

Eugene Odum, a well-known contemporary ecologist, defines biosphere as "the term for all of the earth's ecosystems functioning together on a global scale" (Odum 1975, 4). The living and nonliving components of an area that function together make up what ecologists describe as an ecosystem.

The biosphere is our life-support system and it is where we pursue our economic activities, developing the natural resources available in the lithosphere, hydrosphere, and atmosphere for man's benefit. Development is defined by Bartelmus as "a process that attempts to improve the living conditions of people" (Bartelmus 1986, 3). Unfortunately this process as it has been practiced calls into question the very intent of our attempts to improve the long-term living conditions of people, because the process of development has tended to degrade the biosphere—the support system of all life on Earth.

We have regarded the lithosphere, hydrosphere, and atmosphere—the "commons"—as massive, cost-free unlimited disposal places where we can dump our wastes, our effluent, and our emissions. The commons, whether they are commonly owned grazing lands or a commonly shared atmosphere, are distinguished by the "absence of specific proprietary ownership and consequent freedom of access to all" (O'Riordan and Turner 1983, 266). The biosphere—particularly, its air and its waters—is common to all; it is "not legally owned by any single individual or nation state" (O'Riordan and Turner 1983, 266). We discharge our wastes into the biosphere individually and collectively

under the assumption that the assimilative capacity of the commons is unlimited, principally because we "cannot comprehend the adverse nature of the sum total" of our output (O'Riordan and Turner 1983, 280).

In order to limit the free access to the commons and to prevent their continued abuse, we manage them by government intervention: laws, regulations, restrictions, standards, and controls are the tools we use to achieve better management, applying them with varying degrees of success to the economic development of natural resources. These intervention measures can only work up to a point: how do we prevent someone from driving a vehicle across the fragile sand dunes of a remote area like the Skeleton Coast in Namibia or how do we prevent someone from tossing out a Lion beer can in the middle of Khutse Game Reserve? We can't, because we can't police the behavior of everyone at all times, particularly when the offender is alone without witnesses. In these instances and countless others like them, we must rely on personal control, a system of personal ethics and environmental values that operate irrespective of social scrutiny. This personal behavior "involves the development of an environmental conscience that operates when one is alone" (O'Riordan and Turner 1983, 284). The development of an environmental conscience seems to be yet another challenge and task of environment education.

Furthermore, in pursuing development, we have discovered that the economic benefits we gain are too frequently short-term; that is, because of the time horizon we use in making our development decisions. Time preference is an economic concept, one that is used when we undertake an economic cost-benefit analysis. In such an analysis, future costs and benefits are typically discounted or downgraded, because if "offered a unit of benefit now rather than later, the expectation is that (individuals) will still prefer to have the benefit now" (Pearce and Nash 1981, 41). We humans seem to prefer a short-term time horizon. We want our gain quickly; we do not want to defer the returns on investment until the distant future.

Our discovery is that short-term economic benefits can become long-term environmental costs. The example of hazardous waste disposal in the United States is classic. The costs of cleaning up thousands of sites, both authorized and unauthorized, reportedly range upward to \$22 billion, which is the most recent figure I've heard. Many of these sites are very old, established before we understood the persistent and pernicious quality of the materials we were disposing of and before we understood that land disposal without permanent containment—a

condition that is physically impossible to attain, by the way—was an invitation to disaster. Some of the sites were claimed to be state of the art when they were given planning approval, a state of the art not without its informed critics but one with clear cost advantages over more expensive methods, like waste reduction through production-process modification.

So we saved money for the producers, the disposers, and ultimately the consumers by opting for the least-cost alternative. What we neglected to factor into our calculations were the costs of cleaning up leaking, abandoned, or decommissioned sites. Had the clean-up costs to future generations been included in the initial analyses of costs and benefits, the least-cost alternative selected would have become the highest-cost non-starter.

We are now left with the enormous task of figuring out how we clean up these sites, first, because we really don't know how to decontaminate millions of tons of contaminated soil or how to purify polluted groundwater and, second, because we don't have the public funds available to cover the costs of clean-up. You may have read about the rather sizeable budget deficit we have in the United States. We chose the short-term benefits of low-cost disposal and ignored the long-term benefits of environmental protection, demonstrating the human propensity of preferring immediate rather than deferred return on investment.

In this regard, the developing countries have an advantage. The developed countries have made many costly mistakes and have designed technologies to correct or avoid the blunders of the past. The technologies now available for the reduction and disposal of solid and hazardous wastes are far superior to the ones that led to that waste crisis in the U.S..

There is really no excuse for the way in which solid and hazardous wastes are being disposed of here in Gaborone, given the information we have about proper disposal. The unregulated disposal at the Gaborone dump of toxic and hazardous materials, which are then openly burned within the confines of an urban area, is at once a guaranteed way to increase the incidence of respiratory disease and to introduce known carcinogens into groundwater where they will remain until they are consumed. Why this environmental travesty has been allowed to continue is difficult to comprehend. Is it the failure of technology transfer, in this instance a technology that is readily transferred? Or is it the unwillingness to incorporate the costs of environmental protection into financial accounting now, choosing instead of defer these costs until the future when remedial action will be required? The future, proportional costs of

disposal clean-up and health care—and the subsequent lost human productivity—will be no less for Botswana than they are for the U.S.

Somewhat belatedly, we have come to realize the consequence of our attitude towards the environment and we now seek to develop natural resources within the framework of the environment by utilizing “sustainable development”, an approach to development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987, 8). The term “sustainable development” has become the buzz-word of the 1990s, in part, because of the prominence given the concept in the World Conservation Strategy released by the IUCN in 1980 and, in part, because it makes good sense to think about the needs of future generations.

But two problems attend the successful application of sustainable development: the first is that of defining needs. How do we define “needs?” Is it according to the prevailing attitude of needs and wants in western societies, where more and bigger shape perceptions of need? Or do we define them according to Abraham Maslow, a psychologist who created the hierarchy of needs to describe the path to self-actualization, a state of being where having more bigger material goods are unnecessary to the attainment of personal fulfillment and spiritual growth. In Maslow’s view, the foundation for self-actualization is the satisfaction of basic needs, into which he includes physiological needs (air, water, food, shelter, sleep, and sex) and safety and security needs (Goble 1970, 52).

Maslow’s basic needs do not differ radically from those articulated in the 1974 Cocoyoc Declaration that attempted to shift the emphasis of development from national economies—gross national product, GNP—to human well-being. The Declaration pointed out that “Human beings have basic needs: food, shelter, clothing, health, education” (Conyers and Hills 1984, 27) Fulfilling these basic needs, according to the Declaration, had to be the primary objective of development. The question of need is one that must be laid at the doorstep of developed economies, where inflated need satisfaction ultimately translates into increased energy and materials consumption. Consumers in North America, Europe and Japan have to reduce their excessive consumption, if the consumption prerogatives of developing-country consumers are to be met with equity.

A second problem that must be addressed before sustainable development becomes a truly viable strategy for development is the matter of population growth. If consumption demand,

whether now or in the future, is to be satisfied from a finite resource base—and the Earth’s resource base is finite—we must check the numerical increase of our population now. Sustainable development in which the needs of future generations are not compromised is simply untenable in light of global population increase as it is occurring presently in Africa, or in India, Latin America, and parts of Asia. How can we possibly expect to assure future generations that their needs will be met without compromise, when the present generation is annually adding millions to the pool of future consumers? We can’t. The problem of population growth—growth beyond replacement, I might add—is given over to the developing countries to solve, if sustainable development is to work in practice, and not just in theory.

Assuming that the issues of need and number can be resolved, let us go on to see how we might realize sustainable development. One of the tools used in implementing sustainable development is the environmental impact assessment (EIA). With its use, we are able to identify, predict, and mitigate or enhance the adverse or beneficial impacts to the biophysical, socioeconomic, and archaeological environment prior to development. EIA is a process and it is an attitude, as a speaker at a recent conference here in Gaborone suggested. It is a process because there are certain stages in its implementation—stages that I will briefly discuss here today. The stages include:

- *screening* proposed projects, programmes, or policies to determine which will require an EIA;
- *scoping* to identify the important issues and concerns to be addressed in the EIA;
- *impact identification* in which the likely environmental impacts are identified for detailed investigation, bearing in mind that the term environment encompasses the biophysical, socioeconomic, and archaeological conditions that may be affected;
- *impact prediction and quantification* during which the character, quality, and magnitude of the impacts are predicted—beneficial or adverse?, long-term or short-term?, reversible or irreversible?, local or regional?—and changes in the state of the environment are measured;
- *impact mitigation or enhancement* by which measures to ameliorate or augment negative and positive impacts are designed to prevent harmful impacts and facilitate beneficial ones;
- and, finally, *impact monitoring* during which the mitigation or enhancement measures are observed to determine their efficacy in

achieving their purpose and to provide "an early warning of environmental damage so that actions may be taken, if possible to prevent or reduce the seriousness of the unwanted impact" (Bisset 1987, 7).

Two of the most important features of the EIA process are the consideration of alternatives and the involvement of the public. The first—the consideration of alternatives—is vital to the integrity of the process, because without identifying and evaluating alternatives to a proposed project, whether it be alternate designs, locations, or configurations, we get locked into the notion that there is only one way to accomplish our goal. And if there is only one way to get where we want to go, we are willing to pay high environmental, and sometimes even economic, costs.

The case of the Metsemotlhaba Transfer Scheme illustrates the value of alternatives. Initially two water impoundments were proposed to augment the water supply for Gaborone, one to be built on the Metsemotlhaba River outside of Thamaga and the other on the Kolobeng River near Kumakwane. When an alternative site at Bokaa was evaluated, it was found that a holding reservoir on the Metsemotlhaba River in tandem with a water transfer scheme from the reservoir at Bokaa to the Gaborone Dam would both reduce the costs of construction and compensation by an estimated P30,3 million and the amount of riverine lands lost to clearing by approximately 300 hectares (University of Botswana 1990a, Table 1). So the Bokaa alternative was selected and the project is complete, for all intents and purposes.

The second feature of EIA is the involvement of the public and the importance of this aspect should not be underestimated. The public, particularly those who are directly affected by a proposed project, should be partners in the process of identifying and evaluating potential environmental impacts for several reasons. First and foremost, people living in or near the areas where development is proposed are the most knowledgeable about local issues and concerns, both of which form the basis of subsequent identification of impacts that require further investigation. Secondly, they will be the direct recipients of any environmental costs and benefits associated with project development. Their involvement and counsel in the early stages of project feasibility and environmental assessment can contribute to sound, successful design and implementation, with greater benefits than costs to affected groups.

I mentioned that EIA is both a process and an attitude. If it is to be more than a jobs program or empty rhetoric, EIA requires an attitude of

commitment to environmental protection from public and private sectors alike. The recommendations offered in an EIA must be given equal weight in decision making, and no longer relegated to the back seat while economics continues to drive the engines of growth and development. We either decide to take EIA seriously or we decide to forego the gesture and save otherwise wasted paper.

Having briefly outlined the virtues of EIA for you, let me now turn to environment and development in Botswana. In formulating and adopting her National Conservation Strategy in December 1990, Botswana at once embraced the concept of sustainable development and the application of environmental impact assessment to future development. Section 1.5 of the September 1990 document about the Botswana National Conservation Strategy discusses the importance of sustainable development, enumerating six reasons for its value: in brief,

- the important roles that natural resources play in the nation's economy, society, and culture;
- the complementary relationship between development and resource conservation;
- the use of natural resources on a sustainable yield basis;
- the increase in sustainable yields and resource carrying capacities by improved management;
- the importance of equal weighing to the needs of future and present-day populations; and,
- the assurance that trade-offs are made where development is unavoidably required at the expense of natural resources (Government of Botswana 1990, 3-4).

Section 1.5 concludes by stating that: The principle of sustainable development is also valued because its observance calls for comprehensive evaluation of environmental and economic implications before major new development are undertaken (Government of Botswana 1990, 4). Comprehensive evaluation of environmental implications are to be institutionalized by "making the preparation of both Environmental Impact Assessment (EIA) and associated Statements mandatory for all public and private developers, in respect of scheduled classes of development projects and actions.... In future, preparation (of EIAs) should become part of the formal planning approval process" (Government of Botswana 1990, 44). Legislation is to be enacted, legislation that will authorize stiff penalties for EIA non-compliance, I hope.

Finally, Section 7.4.5 of this same document underscores both the need for legislatively

Developing students' environmental awareness can be as simple as getting outside the classroom and allowing them to enjoy the natural world.

mandated EIA preparation and the purpose of the EIA. To wit: "The purpose of such an assessment is to enable 'the competent authority' (Ministry/Department/District Office) to arrive at decisions on development projects with the benefit of a full understanding of the environmental as well as the economic and social costs, which will be incurred in both the short- and long-term" (Government of Botswana 1990, 72).

A case study of the Northern Plain in the Mpanamatenga area illustrates the use and value of EIA to forewarn decision-makers in the public sector of the consequences to the environment from extending commercial farming to this undisturbed vertisol grassland. Located in the northern part of Botswana near the village of Mpanamatenga, the commercial farming project is currently centered on two pans—Southern and Central Plains—with a third pan—Northern Plain—included in the development plans, but where land allocation and clearing have not yet occurred. The project is based upon the fertility and abundance of the clay soils in the pans, with more than 100 000 hectares of land thought to be arable. Arable agriculture is not new to Mpanamatenga, however. According to a recent article in *Newslink*, the Colonial Development Corporation (CDC) opened the area for maize and livestock production in the early 1950s, clearing a 100 square-mile area of vegetation and killing 25 000 tsessebe in one week to establish the production scheme (Tsiako 1991, 12). The scheme failed and it failed badly: the cattle died and the maize withered because of "the unsuitability of the black cotton soils and poor management by the British project managers" (Tsiako 1991, 12). The experiment was an expensive one, costing the CDC approximately 25 million pounds (in 1950 values) (Tsiako 1991, 12).

In the mid-1980s, the Botswana government decided to try its hand at arable agriculture at Mpanamatenga in an attempt to achieve greater self-sufficiency in basic food crops. To this end, large-scale commercial farming was emphasized and, in early 1983, commercial farmers were allocated 500-hectare plots on a leasehold basis. By late 1989, 24 000 hectares in the Central and Southern Plains had been allocated to commercial farming.

The preferred crop for cultivation is sorghum, because of "agronomic suitability and the fact that it commands the highest grain price subsidy" (Arup-Atkins International 1990a, 2). The



problem with sorghum is an over-supply, so much so that a recent controversy about sorghum centered around its questionable quality after being held in storage for over two years (Inger 1991, 6).

But regardless of sorghum surpluses, the production of it and other crops raised at Mpandamatenga—maize and sunflower, both in limited quantities—is at best problematic and beset with problems. The vertisols of the pans are fertile but they are difficult soils to manage. Vertisols “usually have a loose surface mulch when dry, but below this they are hard and cloddy. When wet the soils become very sticky” (Arup-Atkins International 1990b, 1-1). Rains can turn the ploughed fields into quagmires, bringing mechanical tillage equipment to a halt. An earlier study of the farming project commented that “there are few years which are neither too dry nor too wet, and it is far from rare to encounter both conditions at different times in the same season” (Arup-Atkins International 1988, 1-1).

Crop pests and diseases—not to mention vertebrate pests like rodents and birds—have persistently plagued planted areas. Sorghum leaf blight, which can be combated most cost-effectively by rotating crops—a difficult proposition in Mpandamatenga where sorghum is the principal crop, appeared in the late 1980s to reduce already low crop yields.

Mpandamatenga is far removed from existing service centers, like Francistown, Gaborone, or Bulawayo, where spare parts for farm equipment are to be had; the time spent locating and fetching spare parts is compounded by the time lost from the field either tilling, planting, or weeding.

Because of the production problems and low yields, “many commercial enterprises are in financial difficulties,” with about P20 million of government investment at risk (Arup-Atkins 1990a, 4). Without improved harvests of diversified crops, including maize, sunflower, and sorghum, and improved farm management, the development study completed in February 1990 concluded that “the future prospects for Pandamatenga are clearly poor” (Arup-Atkins International 1990a, 7).

With that short but telling introduction to the Mpandamatenga scheme, let me take you to the findings of the several EIAs that have been completed, all done after-the-fact because the project was started before any comprehensive planning and environmental assessment were commissioned. The first EIA was conducted by the Kalahari Conservation Society in 1987; the second as a part of the Stage 1 report on the Pandamatenga Development Study. The final and most recent EIA is one of sixteen volumes

comprising the Final Report on the Pandamatenga Development Study that was released in February 1990. In addition to assessing impacts from agricultural development on the area's soils, water and drainage, vegetation, forests, wildlife, public health, and archaeology, the 1990 EIA discussed wildlife-utilization options, vegetation on the Northern Plain, electrified game fencing, pesticide utilization, hydrogeology and water quality, and forestry development.

The three documents mentioned above have been summarized in the form of a case study that we use for our EIA inservice training courses at the University of Botswana. I will make use of this case study today in presenting the EIA findings and recommendations. Time limitations dictate that I mention only a few of the most important, however.

Water pollution

“Use of agrochemicals on the commercial farms has increased in the last few years, and there is concern over possible contamination of both surface and underground water. A wide range of pesticides has been applied to tackle various pest problems including control of rats, quelea, bollworm, aphids and termites. Some of the chemicals used are highly toxic and others persist in the environment for a long time and can become concentrated via food chains. Although the vertisol clays are impermeable, and the pesticides are likely to adhere tightly to clay particles, contamination of nearby watercourses may occur following erosion of surface soil during the heavy rains. Boreholes serving commercial farms are located on the edge of the pan areas, near the aquifer recharge zone. Some of these are flooded in the wet season resulting in the possibility of groundwater contamination by agro-chemicals. Lack of proper sanitation to serve the increased population in Mpandamatenga village has resulted in bacterial contamination of the village borehole water supply. Fertilizers could potentially cause eutrophication (nutrient enrichment) in pools and downstream watercourses and health problems associated with high nitrate levels in water supplies” (University of Botswana 1990b, 12-13).

In 1988-1989, twenty-one different kinds of pesticides and related chemicals were in use on the commercial farms at Mpandamatenga, ranging from Aldrin which is one of the most persistent chlorinated hydrocarbons yet devised by man to Aldicarb which is a highly toxic chemical that is applied to the soil to control nematodes (Arup-Atkins International 1990c, 6-3). The effects of these chemicals on wildlife are assessed in the EIA with particular mention made about “persistent chemicals such as aldrin

that may have a longer term effect on the environment through biomagnification via food chains, which might particularly affect predatory raptors feeding on prey killed by pesticides" (University of Botswana 1990b, 13). The effects on man vary, depending upon the level and length of exposure and the toxicity of the chemical involved. But the results are always deleterious to human health. I would remind you that we are part of the food chain, however, so we are at risk from biomagnification. And I would also remind you about the link mentioned earlier between Parkinson's Disease and pesticides in groundwater resources.

Public health

"The total population of Mpandamatenga is under 3000 yet the local health clinic already treats over 5000 individuals cases a year. Health problems have increased with the recent growth of the village and would be exacerbated by further development of agriculture and influx of migrant workers. Future problems are likely to include spread of sexually transmitted diseases, alcoholism, malnutrition, pesticide poisoning, and increased incidence of communicable diseases" (University of Botswana 1990b, 14).

Aside from vector borne diseases like malaria and schistosomiasis that have only marginally increased, the most serious health problem in the area is the increase of sexually transmitted diseases (STDs), with "23 percent of civilian males and females in Pandamatenga having clinical signs of STDs" (Arup-Atkins International 1990c, 2-11). The STDs incidence may be much higher than the testing of these civilian males indicates, because there are around the same number of mostly single, sexually active soldiers at the Botswana Defence Force camp near Mpandamatenga. AIDs cases have been reported, but their exact numbers are unknown.

Alcoholism is increasing. With nowhere to go and nothing to do in Mpandamatenga, alcoholism is "a recognizable syndrome of...geographically isolated migrants who have no other outlets for spending or recreation" (Arup-Atkins International 1990c, 2-12).

Wildlife resources

"Wildlife resources have already suffered severely during the existing development and similar impacts would result should the Northern Plain be developed. Loss of the important grassland plains has led to a decline in Botswana's oribi population, and in local populations of tsessebe, reedbuck, roan, sable, zebra and white rhinoceros. Farm settlements and related developments within the ecotones are displacing animal species which inhabit or migrate across these areas. Limitation of wildlife migration and

access through these areas could isolate Kazuma Pan National Park, and parts of Chobe and Hwange National Parks from seasonal populations. Wildlife populations are likely to decline further as a result of reduced viability of commercial and subsistence hunting, game viewing, and tourism in the surrounding areas (due to developments), so limiting scope for wildlife utilisation in and around the study area. If the farms are not fenced, wild animals will continue to be shot where they have been found to have damaged, or likely to damage farm crops. Increased populations in the area are also likely to result in increased incidence of poaching and disturbance to wildlife" (University of Botswana 1990b, 13).

The impacts from arable agriculture on wildlife resources are manifest in the foregoing text; they require no further explanation, except to add that Northern Plain is the last remaining vertisol grassland plain in Botswana. Losses of grassland habitats specific to certain species and migration routes for animal species moving between Botswana and Zimbabwe during the wet and dry seasons cannot be mitigated; these losses are permanent and irreversible. One additional explanation is necessary: reference is made to fencing of the farms in order to reduce crop damage and wildlife shooting. A stipulation in all lease agreements signed by the commercial farmers requires that "the Grantee (leaseholder) shall fence the boundaries of the leased land within 12 months of the commencement of this lease: (Arup-Atkins International 1990d, IV-2). To my knowledge, not one metre of fencing has been erected since farming began in the mid-1980s; 120 kilometres have been called for in the development study and environmental assessment. Had the lease requirements been enforced, fewer crops would have been damaged and fewer wild animals would have been shot for trespassing onto cropland.

The evidence is in and it is compelling. The adverse impacts from extending arable agriculture onto the Northern Plain outweigh the benefits. Even the Pandamatenga Development Study does not "recommend expansion of large scale commercial farming into the Pandamatenga Northern Plain" (Arup-Atkins International 1990a, 18). The European Community has limited its future funding to support of research only. The National Development Bank is unwilling to loan more money for farm development, since many of its current loans in the area are non-performing.

There are viable options to arable agriculture in Northern Plain that are far less destructive to the biophysical and socioeconomic environment. An obvious one is wildlife utilisation,

including game viewing, safari hunting, and subsistence hunting, in part for the benefit of the sizeable population of Basarwa who live in the area. Wildlife utilisation, particularly game viewing and safari hunting, is a proven foreign exchange earner and is emphasised in the National Conservation Strategy proposals for sustained development of the wildlife sector.

Yet plans are afoot to extend commercial farming onto Northern Plain, with the help of the Japanese Development Bank. The challenge now becomes one of either heeding the warnings or proceeding with business as usual. Will the rich, natural attributes of Northern Plain be forever lost in the pursuit of an illusory dream, one that has become an environmental nightmare? Will consideration of the environment in making this development decision remain a discretionary exercise, one that is still relegated to the seat behind economic interests? Our tasks as environmental educators and environmental administrators are always demanding and sometimes daunting. But for the sake of future generations, they must be done. We must hold fast to the notion that "we have not inherited the earth from our fathers, but that we are borrowing it from our children" (Brown 1982, i). Our duty is to return it to them intact, if not improved. In so doing, we will have come full circle from the theory of sustainable development to its application in word and in deed.

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Environmental education and sustainable development

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Introduction

Lets start with some definitions: What is Environmental Education and what is Sustainable Development?

Environmental education

Environmental education is, of course, to educate people—children and adults—on environmental matters. It can be carried out in schools or universities, in an interdisciplinary way or as a subject on its own. It can also be carried out in a more non-formal way through different media—radio, TV, posters, comic strips, gatherings and clubs.

The main objectives of environmental education are:

- awareness; to create an awareness among individuals about the environment, with its assets and problems,
- knowledge; to give individuals a basic understanding of the environment and to make them understand humanity's central part in the environmental problems we can see around us,
- attitudes; to create values, attitudes, feeling and concern for the environment among individuals,
- skills; to equip individuals with skills enabling them to solve environmental problems,
- evaluation ability; to help individuals evaluate the environment and environmental measures in a holistic way,
- participation; to create a sense of responsibility regarding environmental problems so as to ensure individuals take the appropriate action to solve these problems.

In short the aims of environmental education are what the people of the world should feel, know and do about the environment.

Sustainable development

A more controversial issue is that of sustainable development. The Brundtland report defines it as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

More precisely you can put it as "The development of a capacity to convert a *constant* level of natural resources into *increased* satisfaction of human needs".

In the latter you can sense a contradiction. How can a constant input give an increased output? Through efficient use of course! But there is a limit to efficiency, and development does not know any limits. So the question is if sustainable and development are two compatible words? Is sustainable development something achievable or is it utopia? It is a difficult issue, but no matter if we can achieve it or not, sustainable development is the goal and we must strive towards it. Development, no matter if it concerns a developing or a developed country, must be as sustainable as possible.

In order to come as close as possible to the goal of sustainable development, the Ontario Round Table Group has identified the following guiding principles to meet the challenges of sustainable development.

- Anticipation and prevention, which includes environmental considerations and environmental impact assessment before decisions are made.
- Full cost accounting. To take considerations like depletion of natural resources, pollution and weigh these against the output.
- Informed decision-making. integration of environmental and economic decision-making.
- Living off the interest (doing better with less). For example, enhanced natural resource management, recycling and efficient energy use.
- Quality over quantity. To change peoples attitudes and to lower their consumption.
- Respect for nature and the rights of future generations.

The history of environmental education

Environmental education is not something new. Thousands of years ago children were brought up by their parents and taught what plants and animals they could eat and how to

collect them. That is environmental education—getting to know your environment.

Environmental education became an issue on the international arena in Stockholm in 1972, at the UN Conference on the Human Environment. There it was recognised that environmental education was a simple tool to make the people of the globe more aware of the environment and more active in the protection of the same. The UN member states recommended that the Secretary General should take the necessary steps to establish an international programme of environmental education, interdisciplinary in approach, encompassing all levels of education and directed towards the general public.

It was in the same conference that United Nations Environment Programme (UNEP) was born and a year or two later UNEP was established in Nairobi, Kenya. The first UN Headquarters to be situated in a developing country.

International Environmental Education Programme

In 1975, UNESCO and UNEP launched the International Environmental Education Programme (IEEP), in order to fulfil the recommendation from 1972. The objectives of the IEEP are:

- to give access to information in the field of environmental education, through networks and the Connect Newsletter.
- to carry out research concerning the pedagogy, content and methods of environmental education.
- to develop educational programmes, that is, curriculum development and teaching materials.
- to train personnel through seminars, workshops and courses for teachers (pre- and in-service training), teacher trainers, school planners and curriculum developers.
- to integrate environmental education into technical and vocational training.
- to educate and inform the public about the environment and its problems through producing media-related education programmes, using new communication media, developing exhibitions in museums and creating a bank of audiovisual programmes (video and computer).
- to develop the general university education through creating an awareness among the academic authorities, intra-university cooperation and development of the integrated study programmes on environmental issues.
- to promote specialist training including decision makers and administrators.
- to promote international and regional cooperation.

Many of these objectives were formulated and strengthened in the Intergovernmental Conference on Environmental Education in Tbilisi in 1977 and further amended and developed in the Tbilisi + 10 meeting (the Moscow Congress of 1987 on Environmental Education and Training).

In these conferences it was considered that environmental education should be made an integral part of the entire educational process and aimed at every category of the population. The declarations and recommendations of these conferences made it possible to define the nature, objectives and pedagogical principles of environmental education and to establish broad guidelines for action in this field at the national and international levels.

Since Stockholm 1972, the environment has moved to become a central issue in people's minds, from being a forgotten and neglected issue. Today everybody talks about the environment and people around the world live under a threat to their daily lives because of a badly managed environment. We should take this chance to make people understand the benefits of environmental education.

The work of UNEP

UNEP's work in the field of environmental education and training is implemented through various organisations and universities, since UNEP itself is a catalysing and not an implementing agency. All the work in environmental education falls under the IEEP.

About 20% of UNEP's budget is spent on training. Specialised training is carried out by the Units concerned, while general environmental training is carried out by the Training Unit. In 1977, it initiated in collaboration with UNESCO, at the Dresden University of Technology, one of the world's first post-graduate courses in environmental management for participants from developing countries. Last week the 15th course started in Dresden and twenty participants from 18 countries will attend the ten month course. In 1990 a similar course was designed with Tufts University in Boston, USA. It is an intensive training programme for environmental managers from developing countries and at the moment about fifteen participants from thirteen countries are attending a four month course.

In November a month long programme will start for the first time, called UNEP Environmental Management Seminars, at UNEP headquarters, Nairobi. We also arrange courses on environmental issues and considerations for industrial managers, geologists and journalists.

In addition to training, UNEP also promotes the spread of information on environmental

Delegates and the general public were entertained on two evenings with an environmental play by the theatre group Reetsenang

training through regional networks. We also give advice to universities in the process of starting up courses on their own in Environmental Management.

UNEP's activities in the field of environment are focused on a number of areas of concentration, defined in 1989. These areas of concentration are:

- climate change and atmospheric pollution. An example of UNEP's action is monitoring the greenhouse effect and also preparing an international convention on the issue of global warming,
- the Global Protocol (Vienna, 1985) and the Global Convention (Montreal, 1988) for the protection of the ozone layer have received a lot of signatures from the member states,
- pollution and the shortage of fresh water resources and the protection of the fresh water resources of the world through sound management. Clean and safe tap water for everyone is, of course, a main goal. In 1985 UNEP launched the programme for the environmentally sound management of inland water (IMINWA), a major initiative aimed at safeguarding the world's fresh water.
- deterioration of coastal areas and oceans. To protect the open seas and coastal areas and their inhabitants through international cooperation. Again international agreements are the base of UNEP's work, such as the Mediterranean action plan.
- land degradation and desertification. UNEP is, through other organisations, creating a greater public awareness about the problems. It is also coordinating the UN Plan of action to combat desertification.
- conservation of biological diversity. To recognise the value of maintaining a high bio-diversity. At the moment an international convention on the issue is being developed.
- sound management of hazardous wastes and toxic chemicals and to minimise the impacts of hazardous wastes through dissemination of information, promotion use of environment impact assessment into industrial development and development of low-waste technologies. The Basel Convention was launched in 1989 by UNEP to control the transboundary movements of hazardous wastes.
- environmentally sound management and use of biotechnology.
- protection of human health conditions and quality of life. Of course, all the work of UNEP is aimed towards this last goal. Protecting a tropical forest, a river or the ozone layer also helps to protect the human health and therefore quality of life. Education is a very important way of directly improving peoples health conditions and quality of life.



Many NGOs and aid organisations are carrying out work in similar areas and with similar projects. However, UNEP is unique in its possibility to develop international legal instruments, like the ozone protocol and conventions on global warming and biodiversity, for sound management of the environment and aiming towards a sustainable development.

United Nations Conference on Environment and Development

Some people have already named the 90's as the environment decade. This is the time when we have to do something in order to be able to straighten out the problems we have caused. So, what is there in the future to look forward to?

Next year, in June, the UN Conference on Environment and Development (UNCED) will be held in Brazil. It is the 20th anniversary of

the Stockholm Conference 1972 and it is supposed to be the biggest UN Conference ever arranged. There will be thousands of people attending and the UN agencies have been working since last year with preparatory committees in order to make the conference run smoothly. That conference will direct very much of the future international work on the environment.

Environmental education: what to include and how to do it?

Let's come back to environmental education with the questions of what and how?

Key concepts of environmental education

There have been many suggestions of what are the key concepts of environmental education. Back in 1944 an American researcher determined over 500 major and minor principle biological sciences of importance to general education. Since then several people from different parts of the world have come up with new lists of what Key Concepts of environmental education should be (Atchia 1978, 40 concepts, Roth 1969, 112 concepts). The latest is Donella Meadows' 8 key concepts of environmental education, published in her book "Harvesting One Hundredfold". These concepts are:

- **Levels of Being:** There are three distinct levels of being: Human, Biological and Physical. But all systems obey the same physical laws.
- **Cycles:** Matter cannot be created or destroyed. All materials necessary for life, water, carbon, oxygen, nitrogen, etc. pass through bio-geochemical cycles, which maintain conditions hospitable for life.
- **Complex Systems:** Everything is connected to everything else. Different systems are connected through flows and these systems are finely tuned, stable and resilient.
- **Population Growth and Carrying Capacity:** Populations of living organisms tend to grow exponentially, until limited by other factors. Human activity can enhance or degrade carrying capacities.
- **Ecologically Sustainable Development:** Human wealth and economic development ultimately derive from natural resources. These resources are sufficient for all living creatures if they are managed efficiently and sustainably.
- **Socially Sustainable Development:** The key to development is the participation, organisation, education and empowerment of people. Development must be appropriate not only to the environment, but also to history, culture and the social systems.

- **Knowledge and Uncertainty:** We do not understand fully how the world works, therefore we have to make decisions on uncertainty. In order not to destroy a system we do not understand, we have to carefully assess and experiment prior to make any final decisions.
- **Sacredness:** We have to understand that nature has a value of its own and that it is a basic human need to enjoy a healthy and beautiful environment.

We can of course find other things to add here, but these are eight major concepts of what environmental education should deal with.

How to incorporate environmental education into existing systems?

And now, how to do it. There are many ways and it depends very much on the existing educational system. Preferably environmental education should be introduced as an interdisciplinary subject and not as a subject on its own. This is especially important in the lower levels, like primary and secondary schools. If we go back to the main objectives the primary school should aim at fulfilling the first three objectives: awareness, knowledge and attitudes. The secondary school should continue this and address all objectives.

To develop a curricula that incorporates environmental education into all subjects is of course important. But as it is the teachers in the schools that carry out the thoughts and contents of a curricula, it is very important to develop the resource a country has in its teachers. That is done mainly through pre-service teacher training in the teacher training colleges, but also through in-service training. Another important way of making a curricula possible to implement, is to provide schools with relevant equipment and literature to support the teachers in their work.

At the university level environmental education can still be taught in an interdisciplinary approach, but also as a subject on its own. Many universities around the world have started up or are on their way to start up courses in environmental management or environmental studies.

Environmental courses are also appearing in the study courses of engineers, lawyers and planners, just to mention a few. Outside the formal system of schools and universities, there is the non-formal approach of dissemination of information through various media like radio, television, exhibitions, advertisements, participation projects, etc. aimed towards all people, but especially towards the people that have

already left the formal education system.

Conclusion

If we are in the environmental decade now, how are we going to make the 21st century the environmental century. One contribution towards that goal is environmental education.

We understand the need to develop in a sustainable way. Then everybody must participate and add their contribution towards that goal. That is why environmental education is so important. The presidents, ministers, decision-makers and industrial managers of 2030 are about to start or are already sitting in the primary school today. It is our responsibility, to educate them and not only to make them literate, but also environmentally literate.

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Environmental education: implications for education

Martha C Monroe

North American Association for Environmental Education

Dumelang. Thank you, Mr. Chairperson. I am delighted to be able to speak to you today and to share some perspectives and experiences from North America as you plan the direction of environmental education in Botswana. I thank the organizing committee for extending an invitation to me, and the United States Information Service for making my visit possible.

I was asked to speak about the implications for education from environmental education. This immediately assumes that environmental education is somehow different, in a very basic way, from what usually occurs in Botswana's schools today. Well, in fact, environmental education is different from a typical American school as well, so I think we can explore this topic from both a general and specific viewpoint. Before we can discuss the implications of environmental education, we all should have a common understanding of environmental education.

Because environmental education means so many different things—formal education, nonformal, teacher training, environmental professional training. I would like to begin by showing some examples of environmental education programs and activities. From these images I will draw several common denominators and we will look at the implications for education of those. Finally, I would like to provide some advice to you as you go forward in the development of environmental education.

What is environmental education?

(Slides were shown that illustrate a variety of programs in environmental education, and explain how the five objectives of environmental education can be translated to the real world: awareness, knowledge, attitude, skills, and participation.)

The typical nonformal approach is a guided walk or interpretive exhibit but it also includes urban exhibits and opportunities to discover more about nature or environmental issues. It can be conveyed through theatre—indoors or outdoors, such as here in Gaborone—or music and art.

As has already been said, environmental

education has five objectives. The first is awareness, such as carefully examining nature even in cities and villages but also becoming more aware of issues. Issues such as how many cows have died, or will breathing this air hurt me?

Closely associated with awareness is building greater understanding through knowledge. Some examples are, collecting data, seeking information, and experiencing nature by walking across a dam made by large rodents. Students can also gain knowledge by finding out about a problem and solutions.

With learning information comes supporting attitudes. When we are engaged or having fun, positive attitudes are formed. When an issue is emotional, or pathetic or hits close to home our attitudes are affected. But all these components are not in themselves enough. We must also have skills to help solve environmental problems. Skills like cooperating, information seeking, public speaking, writing—publishing and data analysis are the types of skills students can practice in school.

The fifth objective is participation. Environmental education includes opportunities to involve learners in action, as well as a chance to study, explore and analyze problem solving cases. This could mean something as simple as beautifying your neighbourhood, joining an organisation, attending a rally or cleaning up a mess. It's when we listen to each other, discuss issues and work together that we can protect our environment and cultural heritage for the children of today and tomorrow. (The slides ended here.)

Now some of you may be concerned about what awareness and participation mean in Botswana. It's easier, of course to limit environmental education to knowledge. Students need to be aware of and knowledgeable about soil erosion, overgrazing, water conservation and litter/recycling. But here is the important point. If we limit environmental education to disseminating information we are making two huge assumptions:



An environmental education class at Maitlamo Primary School in Lobatse are coming to grips with soil pits.

- that we know it all—that we are informed about the problem, various solutions, and their ramifications, and
- that information is all we need to solve the problem.

If we look elsewhere in the world, we find environmental issues always come with uncertainty and are always changing. Good solutions, like using CFC's in refrigerators may later have horrendous consequences—like thinning the ozone layer. The world is always changing. We do students no service if we only provide information. As educators we must also help them develop the skills to collect information, work together and resolve problems that we do not even know about yet.

The idea of participation does not mean that every teacher spends a term rallying the village around an issue. It does not have to be physically going out and taking action. It can be studying action, that is, reading about projects that involve citizens. Or it might be a project that students undertake at their school. Your own Okavango delta provides a good example of

the importance of the process used to make decisions and to involve the public.

But let's get back to the implications of environmental education for education. I would like to suggest the following three common denominators for environmental education and then explain their implications. These are my opinions — and I put them forth for discussion purposes.

Good environmental education addresses the local environment. That's what learners are curious about, that's where their attention and interest lie. Therefore, environmental education is meaningful and relevant to learners. Students could explore how many mopane worms live on a tree, and how far their grandparents walked to collect them. What adaptations does the gemsbok have to the desert — and why don't they trample the plants like cattle?

Since all schools, all teachers, all environments are not identical this may mean that environmental education encourages variation in the curriculum, within the context of national goals and objectives. This flexibility requires teacher training and responsibility.

Second, good environmental education includes information and addresses attitudes and skills for solving our problems. In an educational program that is primarily information based, this means that environmental education

is different. It involves students in reflecting on their values and attitudes and it helps them develop skills. It is an active process of growth and development. Furthermore, good environmental education empowers students and teachers. How can you talk about wise action taking and solutions to environmental problems without being motivated to change your personal habits to reflect your values, or find out about a local issue of concern?

Finally, environmental education is merely one simple message repeated in many different forms. And that message is, "We must take care of our resources and our waste products to live sustainably on this planet." This message is repeated in a unit on soil, a study of energy, a chapter on water, and a survey of litter. It's the same message over and over. This is more effective than a typical educational program, because we don't learn from one exposure to a concept, we need to experience a concept several times.

This means that environmental education is memorable. In several ways, environmental education is different. It is mission-oriented, not information-oriented. These concepts are not unique to environmental education. For example, the new movement in science education toward STS (science/technology/society) as well as other mission-related fields, such as health education and peace education also echo these claims. The significant thing is that these implications are new to traditional formal education, which means teachers haven't been trained to teach this way.

There are secondary implications of these points, for teacher training and resources, and discussions about these are perhaps appropriate for your workshops tomorrow. I have some thoughts about how to get from here to there. This is obviously a huge challenge — certainly the United States has a long way to go, too.

- Start with easy steps. Not the Okavango, but maybe local litter or school water use. School

Projects are an excellent way to involve students in problem solving.

- Use small experiments—try and play. Reflect. Communicate. Test out ideas with experienced teachers before implementing them on a large scale.
- Support each other and share successes. It is very different to say —"here's an activity idea for teaching about air pollution" and "here's an activity I did—the kids liked it and I would change step three a little bit."
- Seek support and successes outside Botswana. There is an extensive international community doing this—many are overcoming the same barriers you will wrestle with. One possibility is to attend an international conference in Toronto, Canada next year. It will attract 5 000 educators and environmentalists.

I would like to conclude by saying that even though I am an environmental educator, committed to helping teachers, curriculum developers and learners understand their environment and their role in its protection, I do not believe environmental education is the only answer. Several speakers have mentioned the importance of behavior change to resolve our problems and have charged environmental education with doing so. Well that's unfortunate. I believe that implies a much greater faith in education than is appropriate—at least in the United States.

Knowledge, attitudes, skills, interest and motivation won't get very far if alternative behaviors are inconvenient, expensive, or impossible, or if the social norm does not encourage experimentation and the new behavior. We can't change behaviors without education but we can't expect education to work miracles. We need legislation, incentives, role models and leaders to help change behavior, too. In this respect environmental education becomes one element of a broad program to achieve sustainable life on this planet.

Environmental education in Kenya: experiences and prospects

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Introduction

Environmental education is vital to the survival of mankind. Without educating the masses, they will continue to mismanage and destroy the environment on which their existence depends. Kenya has demonstrated a major commitment to educating and training all of its citizens in the preservation and conservation of all resources for present and future generations. Because of this commitment, it is one of the leading countries on the African continent in the implementation of environmental education and training programmes at all levels of education.

The purpose of this paper is to review the state of environmental education in pre and post independent Kenya and beyond the year 2000. The paper examines how environmental education concepts and practices have been incorporated into the curricula of primary and secondary schools. In addition, it highlights significant aspects of environmental education and training at the tertiary level in Kenya and its contribution to national development.

The NGOs have also made their contributions in this area. The concepts of environmental education have been widely discussed and deliberated in many national, regional and international fora. Several of these concepts have been included in major national documents such as development plans stressing key issues for development. Issues pertaining to natural resources such as the traditional role of forests, afforestation programmes and soil conservation projects have been translated into the school curricula with the aim of controlling human activities that may be harmful to the environment. Thus, development needs, training needs, and protection the total environment and its resources can be balanced in the overall development process. This development process incorporates the contributions of formal and non-formal education practices, and the NGOs have also made a significant impact in the implementation of environmental education programmes at the grassroots levels.

With this brief introduction, it is necessary at this point to provide the background of a

UNESCO-UNEP venture, the International Environmental Education Programme (IEEP) and its objectives in the development of environmental education training and other related programmes.

The development of the International Environmental Education Programme

It was at the United Nations conference on Human Environment in Stockholm, 1972 that the world governments of the United Nations called for a global strategy for combating environmental degradation through the use of a wide variety of approaches; within the formal and non-formal education, and involving in-school and out-of-school populations. Since that conference, many meetings, workshops, symposia, pilot projects and other action programmes have been conducted at global, regional, national, local community and institutional level. The results of such activities have been collated, discussed and refined and recommendations for their extension or in implementation documented at international, regional and national meetings such as those held at Belgrade, Brazzaville, Tbilisi, and in Kenya, at the National Symposium, the Association of African Universities Workshop and the Kenyatta University Workshop.

At meetings such as these, problems related to environmental issues, programme development strategies, environmental needs and priorities, teaching/learning materials development, and a host of other issues have been identified and recommendations formulated as they apply to the various audiences and educational levels.

Specific examples of the machinery which have been established to promote environmental education include the UN's agencies such as the United Nations Environmental Programme (UNEP) whose headquarters are in Nairobi. Kenya established the National Environment Secretariat (NES) and the Presidential Commission on Soil Conservation and Afforestation (PCSCA) several years ago.

Of special interest to the continent of Africa and specifically Kenya is the resulting imple-

mentation of environmental programmes at different levels of education. There are pressing problems in Kenya including soil erosion, deforestation, over-grazing, industrial pollution, and drought. Concerns about managing and safe guarding the environment in the continent have long been debated and discussed, and objectives have been developed by international and national organizations. A meeting of experts in the scientific community was convened in Nairobi, Kenya in April 1983 to deal with key issues in environmental education and training, particularly the awareness of the local leadership of their effect on the environment. Consequently the ultimate goal of UNEP's Programme of Action for Environmental Education and Training in Africa is to initiate a viable environmental literacy programme for the present and future generations. The objectives of the programme are:

- to provide a framework for catalyzing, coordinating and organizing environmental education and training activities in Africa at the national, regional and sub-regional levels for all systems of education.
- to provide an agreed framework for the programming of environmental education and training activities in Africa, that countries can use to assess and promote the incorporation of environmental dimensions in their own education and training systems.
- to promote general awareness of the need for environmental education and training in the region, based on information exchange about activities, programmes and materials which have been developed.
- to promote a framework to facilitate compilation and production of materials for developing environmental education and training in the region.
- to create educational conditions which will make people in the region aware of environmental problems and equipped with the skills necessary to prevent new ones.

In order to accomplish these objectives, UNEP's environmental education and Training Unit identified four vital elements:

- institutional (governments) coordination of environmental education and training activities
- curriculum development incorporating environmental education in the existing curricula
- training programmes encompassing the preparation of teaching guides, bibliographies and diversified instructional materials to aid educators in the implementation of the

programme

- research in institutional and methodological changes needed to incorporate environmental education and training into educational and training systems.

These four elements complement each other in their approaches and in their efforts to disseminate information and impart knowledge on environmental education.

Evolution of environmental education in Kenya

Pre-Independent Kenya

There are over forty ethnic communities in Kenya, and traditionally, environmental education has been with the indigenous African populations since time immemorial. People in diverse environmental settings which exhibit a wide range of terrains, environmental factors and niches, have been interacting with the world around them and teaching their children the value of conserving, protecting, and sustaining the resources. Although many people in the pre-independent Kenya did not know how to read and write, they relied on their traditional education which transmitted its environmental knowledge through story telling and practical experience passed on from one generation to the next. This education was very effective and emphasized the value of living in harmony with the environment. Indigenous Kenyans during this period had a very sophisticated perception of their surroundings and a deep reverence for those systems. The older generation passed on both their understanding and their reverence diligently from one generation to the next and taught that nature was external to and more powerful than humans. Nature was perceived as being so powerful that it could certainly affect the human beings and not vice versa.

In a nutshell, environmental education was essential to protect people from the dangers of nature and to utilize the natural resources in a sustainable fashion. Traditionally people were mindful of the well-being of other organisms which depended on similar resources in the environment. President Kenyatta once said

"A man is the owner of his land...but in so far as there are other people of his own flesh and blood who depend on that land for their daily bread, he is not the owner, but the partner, or at the most, a trustee for the others. Since the land is held in trust for the unborn as well as for the living, and since it represents his partnership in the common life of generations, he will not lightly take it upon himself to dispose of it".

The statement emphasizes that land is a natural resource essential for all living things. Without indigenous education to integrate

elements of environmental education into its system, and which ensures a collective responsibility on the management of natural resources, life would have been difficult. In fact it can be speculated that during pre-independent Kenya, each generation left the environment better than they found or inherited it.

Environmental education in post-Independent Kenya

The introduction of Western type of education, concurrent with other developments including the rapidly increasing human population, has disrupted the indigenous African education system with its integral environmental education component. Consequently, the perception of the environment changed quickly. People started treating the environment with disrespect and instead of living in harmony with the environment, began to learn new methods of dominating nature. To mention only a few, these practices have included: deforestation, cultivating marginal areas, and excessive pollution.

Background of environmental education and training in Kenya

The international emphasis on environmental education and training led to three environmental education conferences in Nairobi, Kenya. The Kenya symposia came shortly after the Brazzaville African Regional Seminar held in 1976. The first of the Kenyan conferences was the Association for African Universities Workshop of 1978. One of the recommendations of the workshop was that "Universities should redirect their traditional disciplines in order to heighten environmental awareness in all students".

The workshop was followed by the formation of Kenya's National Environmental Secretariat at Kenyatta University College in January, 1979. It was resolved here that "Teachers hold the key to that part of environmental education that takes place in formal education; hence, the need for teachers to understand the environmental emphasis".

Finally, in May, 1979 the Kenyatta University College Environmental Education Workshop resolved that "it is nevertheless necessary to offer a compulsory interdisciplinary environmental education course which should tie up the major issues from separate disciplines as they each contribute to a holistic understanding of multi-faced environmental issues and problems".

These conferences, together with the location of UNEP, Habitat, and other environmentally concerned organizations in Kenya, indicate the country's commitment to the management and preservation of the environment. The actions,

together with the initiatives taken by government ministries, including the Ministry for Education and the NGOs, serve to emphasize the importance that the people and Government of Kenya attach to environmental education and training programmes.

Other recent environmental education workshops that have been hosted in Kenya include the Sub-regional Workshop on Teacher Training in environmental education for Africa which took place in April 1986. It was followed by a National Workshop of environmental education in August of the same year. The venue of the two workshops was the Kenya Science Teachers College in Nairobi.

Issues discussed included the definition of environmental education, disseminating, developing and implementing environmental education programmes throughout the educational system in the region.

Impact of UNEP's environmental education and training in Africa

UNEP and other related agencies dealing with environmental education programmes have had significant impact on the policy making in Kenya. The Government's policy is to preserve, improve and prevent detrimental effects on the environment. The preventive measures are more economic than corrective. The Kenya Development Plan 1984 - 88 stated

"The main concern with environment at this stage of our development is to control human behaviour so as to achieve a balance between the development needs of the nation and the enhancement and protection of the environment. Since the economic environment during the plan period will be characterised by shortages of financial resources; resources will not be available on a large enough scale to rehabilitate areas that have already suffered damage. Instead, the thrust will be to strengthen the institutions necessary for the assessment and monitoring of environmental changes that are likely to be harmful in the future."

The Government has realized the value of environmental education and training programmes through formal and non-formal settings. The implementation of these programmes in schools, colleges and universities in the form of training provide awareness of existing and encroaching environmental problems to both youth and adults in the society.

Previously, The Kenya Development Plan 1979 - 83 asserted "... environmental considerations must be brought to the attention every citizen..."

Some aspects of this environmental education have already been implemented. For example, His Excellency, the President has

mobilized the Wananchi (citizens) in soil conservation, tree planting, the chiefs' nurseries, and afforestation activities.

Through Kenya's National Environmental Secretariat several environmental studies have been carried out and reports produced that are necessary for policy-making and training purposes. These materials and others have contributed immensely towards the development and incorporation of environmental education at the primary, secondary and tertiary education.

The primary school level

This section examines what is being incorporated in the curriculum at this level in terms of teaching and learning the environmental education. In this respect the 1979 Development Plan emphasized that "As environmental considerations must come to pervade development decisions taken at every level from family to the Government, these considerations must be brought to the attention of every citizen. Hence environmental education will be introduced in the schools, not as a separate discipline, but as a dimension to be considered in various aspects of the curriculum".

This statement implies that environmental education was to be incorporated into the existing subjects taught in the Kenyan schools, since that the school curricula were already too crowded to consider the introduction of a new subject. In other words, the teaching approach and instructional materials for environmental education should be within the existing school curriculum, in a multidisciplinary and integrated way.

Early initiatives for introducing environmental education at the primary school levels in Africa, and especially in Kenya were developed by the Science Education Programme for Africa (SEPA). In 1971, SEPA produced 'A Guide to the Study of the Environment' which deals with broad man-made environmental concerns. Kenyan educators have been active in SEPA in organizing, disseminating and teaching environmental science.

These activities were funded by UNEP and UNICEF. For instance, the two international organisations sponsored a seminar on environmental science education in Africa during the summer of 1974 in Nairobi. Those who participated in this workshop included teacher trainers, teacher trainees, science teachers, and African scientists from 16 African nations. The aim of this seminar was to look into how teacher training programmes could be fostered through indigenous African structures and customs with an objective of carrying out pilot programmes in the teaching and learning of environmental education.

In 1974 there was yet another seminar in which SEPA was actively involved and this was a pilot seminar on Environment Education Methodology in East Africa. This seminar took place in Mombasa, Kenya and was attended by environmental experts from Kenya, Ethiopia, Uganda and Tanzania. In addition, the consultants to this meeting came from well known organizations such as the Association for the Total Environment (TETE), an NGO education organisation based in the United States.

The rationale of the meeting was to field test an environmental education approach designed by UNEP, the International Union for Conservation of Natural Resources (IUCN), and the World Confederation of Organizations of the Teaching Profession (WCOTP).

The Kenya Institute of Education (KIE) is a major agency that researches and develops curricula for pre-primary education, primary, secondary, adult and continuing education. In addition to developing curricula in these broad areas, the KIE also designs syllabi and develops appropriate materials for each subject taught in Kenyan schools. The KIE stressed three approaches in which environmental education can be incorporated into the existing school curriculum and subjects. These are

- teaching from the environment; an elementary stage in the development of an environmental education programme. The rationale here is to stimulate enquiry and the development of the learning process.
- teaching about environment where the focus is on selecting one specific topic of study to gain more information and understanding.
- teaching for the environment which increases the depth of understanding and broadens the perception of environmental problems.

To complement these levels, the KIE has devised four teaching methods of environmental education in the schools. These teaching processes take the following form:

- inquiry method where learners take an active role in the teaching/learning process through investigating environmental problems and using problem solving techniques to provide potential solutions,
- conceptual schemes where teaching involves the selection of broad concepts within the subject areas for study. For example, conservation of natural resources
- process method where this approach equips the learners with enquiry and scientific skills for investigating problems such as outlining the problems to be investigated, developing

hypotheses, stating the problems, designing instruments for collecting data and making conclusions on the analysed information.

The three approaches to environmental education and the teaching methods developed by the KIE aim at incorporating environmental education topics into the existing subjects. In all cases the stress is on the relevance of the issue to the local situation. The primary schools subjects Geography, History and Civics have been combined into one course, and themes for learning and teaching at each level demonstrate the integration of environmental education. Other courses which teach about environmental issues are science and agriculture.

The secondary/high school level

At this level the KIE has identified key concepts and themes that have been integrated in the secondary/high school syllabi. The KIE has developed courses that incorporated environmental themes into subjects including: Agriculture, Biology, Physics, Chemistry, Geography, Religion, Commerce, History, Art, Music, Mathematics and Technical Studies. In a Social Education and Ethnics syllabus developed by the KIE in 1985 for the Kenya Certificate of Secondary Education (KCSE), one of the provided courses is 'Population and Environmental Education'.

However, the Syllabus of 1982 for the high school, Form V-VI (grades 13-14), already incorporated environment into course work.

Tertiary level—teacher training colleges

Graduate and Teacher Training Colleges offering training for Diplomas in Education provide compulsory courses in environmental education (Kenya Science Teachers Colleges; Kagumo, Siriba, Kisii). The curriculum has been revised to include more concepts of environmental education and practices so that graduates of these institutions would be able to incorporate environmental education into their lessons. The writer of this paper was one of the participants in the workshop conducted to improve this syllabus.

The syllabus for environmental education and training at the Diploma Colleges offers courses that range from an introduction to environmental education to sustainable development and environmental management.

Tertiary level—university sector

There are four national universities (University of Nairobi, Moi University, Kenyatta University and Egerton University) in Kenya. Of these, Kenyatta University (KU) has perhaps developed the fastest in the area of environmental educa-

tion and training.

In the early 1980s, an environmental Education programme in the Faculty of Education was created to provide a specialized training for tutors at the Diploma Colleges. In just a few years of operation, this programme has grown into a Centre for Environmental Education (CEE). It has trained several tutors for Diploma colleges in the MEd degree programme in environmental education.

In addition, the CEE has expanded its course offerings to include a compulsory introductory course of environmental education for all BEd degree students during their first year. This same unit is taken by all Postgraduate Diploma in Education (PGDE) candidates. The unit was first implemented in the 1986/87 academic year and introduces students to the basic concepts, philosophy, awareness and potential solutions to environmental problems.

In the 1986/87 academic year, the Centre developed four units in environmental education for the MEd degree students in the Primary Teacher Education (PTE) programme. The centre developed an MEd degree in environmental education which was approved by the Kenyatta University for its implementation in the 1988/89 Academic year. The Centre has recently been elevated to a Faculty of Environmental Education. Plans and arrangements are underway to develop proposals for establishing teaching and research departments within it. In addition, proposals for personnel, physical facilities and other necessary requirements will be made to establish a strong faculty.

At Moi University in Eldoret, the School of Environmental Studies offers postgraduate studies at the Diploma, MS (Master of Environmental Studies) and PhD levels. This School has also provided a Certificate in environmental education in the past.

Initially, the Moi University was established "to introduce new areas of learning which would help meet the high level manpower requirements of a modern and increasingly technological society".

During the 1986/87 academic year, Government decided to establish a Faculty of Education at Moi University which was a replica of that of Kenyatta University. Thus the unit of environmental education already in place at Kenyatta University was also introduced to all BEd degree students at Moi. Environmental education and training programmes are anticipated to develop in other tertiary institutions of higher learning in the future.

Non-Governmental organizations and environmental education

Based on the above information, the formal

Most delegates agreed that the key to good environmental education in the formal system lay with the teachers.

education system has made significant contributions to environmental education and training. The NGOs equally have played a significant role; in particular they have implemented environmental education programmes at the grassroots levels that include activities such as tree planting, water and energy conservation. The Kenyan President stated "The environmental 'contagion' has caught on well and happily. The result is that Kenya has 11 000 registered and unregistered non-governmental organisations minding the environment. They range from school wildlife clubs and tree-planting groups to mountaineering and other nature-loving societies"

The list is extensive and includes the Kenya Energy Non-Governmental Organisations (KENGO), the Green Belt Movement, Environmental Liaison Centre, Mazingira Institute, Youth P. Groups, Women Groups, and Religious Institutions.

These are clear indications that the Republic of Kenya gives priority to environmental education and training programmes. Despite the financial constraints and lack of adequate personnel trained in environmental studies, the Government will continue implementing environmental education programmes through many channels. With the implementation of the 8 years of primary, 4 years for secondary, 4 years of university schooling system of education, natural resource conservation and utilization education will be expanded and improved and all levels.

More teaching materials are required for an effective implementation, including relevant handbooks, textbooks, films and other materials. Since teachers are the implementers of all curricula, they will be given workshops in which they learn techniques or improvising on materials and improving their teaching.

Future developments of environmental education in Kenya

Primary school

The trends in environmental education at this level are encouraging. As we approach the 21st century, there is every indication showing that environmental issues will continue to be the main points of discussion in the global agenda. Kenya therefore has plans for introducing environmental education in the curricula for primary teacher training programmes to strengthen the dissemination of knowledge and skills throughout the primary school system.

As teacher and learners become conscious and aware about environmental problems, the Environmental Education



likelihood of finding solutions are much higher. In this way the negative human impact on the Kenyan environment may be reversed. In order to strengthen environmental education at the primary level, there is a need develop relevant materials, workshops for teachers, and well planned field excursions for students. It is also important to invite environmentalists to provide lectures regularly on various aspects of the environment and to use the available media in dissemination of knowledge and conservation practices throughout the Republic.

Secondary school level

As indicated environmental education is already incorporated in Geography, Social Science, Home Economic, History, Social Education and Ethics, Science, Agriculture, Physical Sciences, Physics, Chemistry, Biology, Biological Sciences, and Arts Curricula. The 8-4-4 System of Education has incorporated a heavier measure of environmental education into the curriculum. The trend of incorporation of environmental education at this level is stronger than ever before. The indication is that UNESCO will provide more support and educational materials in this area.

Since UNEP has its headquarters in Kenya, the nation's educational system will continue to

benefit from this union as it approaches the 21st century.

Tertiary level

There are many innovations that are encouraging at the tertiary level. In particular, Universities are more autonomous in the development of curricula. The recent establishment of the Faculty of Environmental Education (FEE) at Kenyatta University is an indication that environmental education will continue to have a significant place in the education system. With the expansion of university education, environmental education will continue to be incorporated into many subjects or taught as areas of specialization. For instance, within the recently established Faculty of Education at the College of Education and External Studies of the University of Nairobi more programmes in environmental education will be developed.

Non-governmental organisations

At the non-formal education level, the NGOs have fostered practical activities (tree planting and soil conservation). Their contribution to

environmental education programmes in Kenya continue to grow and expand.

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Experiences with environmental education in formal and non-formal education in Swaziland

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Introduction

Swaziland is fortunate to have deep roots in conservation. Many traditional practices regarding the harvesting of plants and the hunting of wildlife (*butimba*), ensured the protection of the natural resources. In addition, King Sobhuza II, was an avid conservationist. While still *Ngwenyama* (Paramount Chief) in 1953 and 1954, he signed environmentally significant Orders in Council, making provision for soil erosion control measures and for a comprehensive survey of the nation's natural resources. He also promoted the establishment of Hlane as a royal nature reserve, and Milwane, the first nature reserve. His son, King Mswati III, is also actively supporting conservation efforts.

Swaziland was one of thirty four African States participating at the UN Conference on Human Environment in Stockholm in 1972. Since then, it has been making deliberate, consistent efforts to promote environmental training, education and public awareness through various means. The main participants in this endeavour have been the Ministry of Education for formal programmes of curriculum development and teacher training and the National Environmental Education Programme (NEEP) for non-formal programmes. Various extension services and non-governmental organisations, such as the Yonge Nawe Conservation Club Association are now also making important inputs into nonformal environmental education activities.

Formal environmental education and training

Curriculum—Pre-primary level

A joint venture by non-governmental organisations, communities and the Ministry of Education produced a core pre-school curriculum in which environmental education experiences for infants are emphasized. An accompanying core curriculum for pre-school teacher training also includes sections on environmental education.

Curriculum—Primary level

The National Curriculum Centre has the responsibility of writing curriculum and developing text books which are relevant to

Environmental Education

Swaziland's needs. Efforts began around 1982 to infuse an environmental component into subject areas, particularly in the areas of science, agriculture and arts (where a separate unit called 'Exploring and Protecting the Environment' was included for every grade level). These efforts were given added impetus through a short consultancy and workshop for curriculum designers sponsored by UNEP in 1986. The workshop provided curriculum designers with the opportunity to incorporate environmental education concepts into primary school subjects. Currently, environmental education is being integrated into subject areas as new materials are developed and older ones revised.

Curriculum—Secondary level

The National Curriculum Centre has developed an integrated course, 'Development Studies' which is being offered at junior secondary level. Here some environmental issues are studied. One school offers a separate course, "Environmental Systems" at International Baccalaureate level.

Curriculum—Teacher training college level

A three year, post 'O'-level teacher training diploma programme of studies was launched at the three teacher training colleges in 1987. In designing it, the subject committees decided to integrate environmental education into all the subjects, thus special efforts were made in this direction. Many syllabuses, specially those of science, social studies and agriculture include sections concerned with environmental topics.

Curriculum—University level

Whereas some departments such as Agriculture, Home Economics, Science and Geography include environmental topics in some of their courses, few specific efforts to integrate environmental education have been made. However, the University is actively contributing in the area of research on environmental issues. For example, the study into potential desertification in Swaziland, conducted by members of the Geography Department, has been very useful to environmental education efforts.

Currently, there is a special research project investigating biogas and organic fertilizer production which is being conducted by the Chemistry Department. The Science Faculty has embarked on several research studies, including one on water pollution by industry.

Training—Staff development in environmental education for primary school teachers

A national in-service training programme for primary school teachers has successfully been operating since 1985. Among its objectives is to link school and community resources and to provide inservice education on environmental topics.

Training—Staff development

Environmental topics are often included at staff development short courses and workshops for teacher educators, curriculum designers and other education officers. UNESCO has assisted with writer's training in environmental education for curriculum designers. A National Training Workshop for educationalists was also held with assistance from UNEP and UNESCO in 1987, under the International Environmental Education Programme. The participants studied some of the country's environmental problems, devised strategies for incorporation of environmental education into preservice and inservice teacher education and into nonformal programmes and were introduced to the World Conservation Strategy. A similar follow-up workshop will take place this year.

Training—Pre-service for educationists

Environmental education courses have been included in the programme of studies of some participants who have received out-of-country training. However, only very few teachers and education officers have received any specialized training in this vital area.

Nonformal education and training

The National Environmental Education Programme

The National Environmental Education Programme (NEEP) plays a large role in non-formal environmental education in the country. This programme was founded in 1975 by the Mlilwane Trust in response to the dire need to help develop a conservation ethic for Swaziland, which would influence general attitudes and practices towards better management of natural resources in the kingdom. NEEP is under the aegis of Swaziland's National Trust Commission, a parastatal body specially appointed and charged with the protection of the nation's heritage. The goals of the NEEP are:

- to foster appreciation of Swaziland's heritage
- to produce and disseminate information on

the environment

- to promote, organise and sponsor activities and research in environmental education and conservation
- to assist planned rural development by providing environmental education and training in sustainable development to community members and extension officers
- to assist with environmental education for education officers, teachers and students in the formal education system
- to help improve the quality of life of the Swazi people through the constant promotion of an understanding of man's interrelationship and dependence on the natural environment.

NEEP works to achieve its goals through various activities. These are:

- an outreach programme with a mobile vehicle which provides talks, films, slide shows to schools and to communities
- an environmental education centre which provides resources, field experiences and courses to teachers, extension officers, conservation club leaders, and to youth groups
- guided tours and presentations to school groups visiting the game reserves
- field courses for adult and for youth groups
- presentations through the public media
- interpretation at the game reserves
- public awareness campaigns.
- periodical seminars and workshops to provide an environment forum
- input into curriculum development activities to integrate environmental education into the primary schools and into teacher education courses
- training for NEEP education officers and other game reserve personnel.

Currently, one of the major activities of NEEP is the facilitation and implementation of the national "Clean and Beautiful Swaziland Campaign". This is a national campaign with wide participation from government and non-governmental agencies, town councils, commerce and industry, and individuals. Its main aim is to promote public awareness and harness available resources for a cleaner environment. It is also assisting in establishing recycling and in the development of anti-littering legislation. This year, the Campaign has a tree-planting project, whose goal is to plant 20 000 trees during the coming rainy season.

Yonge Nawe Conservation Clubs of Swaziland

Yonge Nawe, which in Siswati means "You Conserve Too" is an independent organization,

Students' innate curiosity is easy to stimulate in the outdoor environmental education classroom.

founded in 1987, to promote the development of conservation clubs as a means of increasing awareness of conservation and promoting sustainable development. Its objectives are:

- to increase understanding of and commitment to environmental concerns and conservation practices among the people of Swaziland, specially among school children
- to make people aware of the urgency of arresting the degradation of the environment which is seriously threatening our economic future
- to promote active involvement of people in the conservation of natural resources, for example, reclamation of eroded areas, collection and recycling of litter, tree-planting
- to increase awareness of the economic, cultural, and aesthetic value of our natural resources
- to provide education for sustainable development, especially at grass-root level.

The organisation is run by a group of people, including several young university students, who give freely of their time and resources. NEEP is also providing support to Yonge Nawe in the way of facilities for workshops, manpower and some transport. Some financial assistance has been obtained from donors for specific projects. Skillshare has recently become involved in assisting with the running of Yonge Nawe. At present, there are over thirty conservation clubs in schools and one adult club. Some of Yonge Nawe's on-going activities include the periodic running of workshops for conservation club leaders, visits and assistance to individual school clubs, the development and dissemination of a monthly newsletter "Imbabala", periodic newspaper articles on conservation issues, competitions, exhibitions, public talks, field trips and participation in national conservation events such as Earth Day, World Environment Day and the "Clean and Beautiful Swaziland" Campaign.

Other non-formal environmental education endeavours

Other organisations, which are promoting special interest areas and contributing to environmental education and training efforts include the Family Life Association of Swaziland, the Natural History Society, the Makhozini



Award Scheme, the Environmental Health Association, the Baha'i Environmental Office, and various extension services of government departments, such as the Land Conservation Unit of the Ministry of Agriculture. In addition, two private game reserves, Mkhaya and Phophonyane, are actively promoting nonformal environmental education through their activities.

While all these activities represent meaningful steps in environmental education, we still have a long way to go in this field and a fast expanding population which needs to grow in environmental awareness.

Swaziland has serious environmental problems, such as a very high population growth rate (3,4%), soil erosion, pollution of water, air, and land, and deforestation. To overcome these problems, and ensure that there will be sustainable development much more needs to be done in environmental education.

I am very pleased to have been able to join you in this conference. This is a very significant step towards joint planning and a holistic approach to environmental education in Botswana. I am sure that its outcomes will influence the direction of environmental education here for years to come.

The past, present and future of environmental education in Botswana curriculum development

F Leburu

Principal Curriculum Development Officer, Department of Curriculum Development and Evaluation, Ministry of Education

To put environmental education into context within Botswana's curriculum development, I would like to reflect on the Botswana National Policy on Education which states:

"The purpose of the schools...will be to prepare children for useful productive life in the real world. They should have the basic skills of literacy and numeracy and the knowledge that will make them self reliant later in life".

This statement forms the core for our curriculum planning. Programmes designed and developed, or being developed, all aim at encouraging learner skills, attitudes, and values and providing knowledge that will make him or her a useful productive individual in the real world. Attempts have been made during the design of the curriculum to present the real world as a multifaceted one with many variables.

It has been observed during the design exercise that the curriculum cannot accommodate all that is desirable to make the child useful and productive but that it could be the starting point. It could present the learner with opportunities to develop and acquire learning tools that could be used in the future. The observation that the curriculum cannot cover everything that the learner needs has led to the policy of integrating most of those issues that learners need or will need in life across the core curriculum, that is, subjects offered to all students in the school system. Environmental education was, during the review and revision years, identified as an area which should be addressed if the quality of life of our learners was to be improved. It was felt that such education should encourage learners to live in harmony with their environments and be in a position to get the maximum output from it but still preserving it for future generations.

During the design of the various subject curricula no attempt was made to map out the scope and sequence of the content areas to be covered in the area of environmental education. Environmental education concepts were integrated into the various subjects when the opportunity arose. This approach led to shortcomings relating to:

- coverage in the subject.
- teaching methodologies suggested and
- assessment procedures suggested.

These shortcomings have been identified by the various consultancies we have engaged to help us evaluate our integration policy. It has become clear that the methods suggested for teaching environmental education concepts fall short of promoting acquisition of knowledge, developing positive attitudes and reinforcing positive practices by the students. A lot still has to be done to improve methodologies for teaching the subject. It has also been observed that for the instruction to bring about the desirable changes there is a need to liaise with other organisations outside the school system as these children ultimately become part of their communities.

It has also been noted that children learn a lot from their peers and if situations could be created to allow sharing of ideas, knowledge between the school going students and out-of-school youth a lot could be achieved. This observation led to a joint effort between Kalahari Conservation Society and Ministry of Education with the assistance of UNDP. A UN Volunteer was engaged in 1989 to assist both KCS and Curriculum Development in networking activities and co-ordinating the outreach programme. The volunteer was charged with the following responsibilities:

- to establish an effective distribution network of Action Magazine and other environmental education materials. Action Magazine is a regional publication addressing environmental issues. It is provided to schools as a resource for both students and teachers. The Curriculum Development Unit participates in its development by contributing articles.
- to assist with inservice workshops at primary level of education to familiarise teachers with environmental education concepts and generate activities they could use in their teaching.

This led to a detailed analysis of existing

curriculum for environmental education concepts and exploring ways of teaching them effectively through the various subjects. The volunteer worked closely with the Curriculum Development Officers in identifying strengths and weaknesses in environmental education concepts integrated within their subjects.

Having identified weaknesses the volunteer was asked to develop teaching modules on environmental education which could be used across the curriculum. The officer also had to develop a teacher Resource Book on Environmental Education based on the 9 Year Basic Education Curriculum.

In addition, the volunteer acted as a link between Kgalagadi Conservation Society and the Ministry of Education on environmental education activities.

This project brought a different facet to our environmental education component. A team of teachers was created to assist the officer and pilot some of the materials developed. The approach used focussed on teacher/student participation. They identified their school based environment projects and with the assistance of the officer started and monitored them. Concentration was placed at the primary level because:

- there is a high dropout rate at standard seven
- teachers at this level needed more help in handling the subject
- chances of involving the community in these projects was higher at this level and children could be made agents of change in the communities

A lot has been achieved during this project; an awareness has been created and interest generated. Those schools which started projects are still monitoring them and requesting more assistance. The project gave us an opportunity to participate and be informed in environmental conservation activities. It laid a foundation for the follow-up project which aims at helping government implement the National Conservation Strategy.

During 1991 we have continued with the development of the teacher resource material with the assistance of USAID. We have continued working with the teachers to develop the resource book which we hope to use as a training document and also a resource for the more structured programme we will be developing during NIDP 7.

The programme to be developed during NIDP 7 falls under the Natural Resource Management Project and it is justified by the following statement:

"The conservation and sustainable manage-

ment of Botswana's Wildlife needs a considerable degree of public understanding, support and action. This can be encouraged through a comprehensive and effective programme of environmental education and training that reaches government personnel and all levels of the population".

The target population groups under this project will be students for the basic education programme, out of school youths, lecturers and teacher trainees (at both primary and secondary levels), curriculum designers and practising teachers. This project brings to us a multifaceted programme covering the following:

- integration of environmental education into the school curriculum to create awareness, develop attitudes and skills and promote positive practices
- increasing awareness on environmental education issues among the out-of-school youths and the literacy groups in non-formal education.
- pre and inservice training of teachers at primary and secondary school level on the teaching of environmental education concepts.
- development of support teaching learning materials for use across these target groups.
- enforcing links on environmental education among agents currently interested in the subject.

The Ministry of Education plans implementation of this project in three phases.

Phase I will be needs assessment aimed at establishing our needs and where we are with environmental education in both the formal and non formal sector. This exercise will be covered by carrying out the following activities in both the formal and non formal sector:

- a situation analysis of curricular materials to identify shortcomings and strong points.
- a survey of teachers to get their views and needs on environmental education. These will be compiled and prioritised and an action plan drawn.
- consulting with teachers to establish a clear definition of the concept of environmental education and listing all related concepts so cross-referencing could be done among subjects.

At the end of this phase we hope to come out with a plan of action that will lead us into phase two of the programme.

Phase II will aim at awareness creation among the different target groups. This will be

done through the use of the different media and by reinforcing existing information dissemination agents. It is hoped that a series of activities such as:

- running workshops for different target groups,
- developing effective radio programmes,
- developing feature articles on environmental issues in consultation with other organisations,
- developing audio-visual instructional materials such as video and films with accompanying instructional manuals,
- piloting the concept of school-community conservation projects in suitable areas.
- continued integration of environmental education issues in the school curriculum and developing instructional materials such as teacher resource books and learning packages.
- launching if possible an environmental education newsletter for the target groups.

In addition to these activities there will be structural improvements within the department to facilitate communication. An environmental education panel made up of all groups interested

in environmental education will be formed and given the responsibility to advise and assist in programme implementation.

Running concurrently with Phase II will be Phase III which will aim more at the development of human resources. Training at both pre and inservice level will be implemented. If the training programme does well there may be a possibility for developing a programme for teacher training colleges and colleges of education. The needs assessment exercise will determine if this is necessary.

The success of this environmental education project lies with all of us gathered here today; our cooperation and support will go a long way to making this dream come true. We hope the project will be evaluated as it is implemented but the ultimate results will be seen in practices and values displayed by its participants.

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Botswana Govt. & USAID 1989 Regional Resource Management Project agreement (690-0252 33)

Botswana Govt. National Development Plan 6 and Draft NDP 7

Teaching methods for environmental education in formal and non-formal education

Martha Monroe, North American Association for Environmental Education
and Ulf Carlsson, United Nations Environment Programme

A variety of teaching methods and activities are available to complement the traditional lecture method of instruction. Together, these methods form a bank of possibilities that teachers can use to deliver an environmental message to a group of learners. The lecture methods needs no further introduction, so we have planned to review some other teaching methods during this one hour session. Those methods are:

- demonstration
- drama
- game
- discussion
- rap song
- cartoon

How wet is our planet?

This activity demonstrates in graphic terms how much fresh water people utilise, over and over again, compared to all the water in the world. Students are likely to think that there is a lot of water in the world—the oceans are full of it. But if we focus on the useable and accessible water, we have much less. As a demonstration, students are not involved in this activity except to guess the percentages, answer the questions, and be amazed at the tiny amount of water in the end. Demonstrations of this type, therefore, may be best for creating awareness of a particular concern. They can be followed by a more participatory activity that would reinforce a concept, or a lecture that would deliver a certain message.

Water cycle skit

One at a time, participants from the audience came to the front of the auditorium to read a card and become part of the water cycle in Gaborone. To clearly demonstrate the place of people in the water cycle, this skit begins with a person, who turns the tap to get a drink. Back through the pipes and pumps to the dam, and back again through the river to groundwater and rain. After the sun is introduced, four people join the line on the person end to read the cards for toilet, sewer pipe, wastewater treatment

plant, and marsh. The line of people can then be joined at the appropriate places to form a water cycle. The repetition of the skit helps reinforce the cyclic nature of our planet's water system. Emphasis can be placed on any component of the cycle, and the cards can be moved or rewritten to fit any community's water supply. The skit can be performed by older students or younger ones, or even written by students as a review.

Oh deer!

To better present African wildlife, "deer" was altered to "gemsbok", and 32 people from the audience came to the front of the room. After instruction, the gemsbok ran across the room to capture a needed element of their habitat—either food, water, or shelter represented by participants making sings for those elements. A count of the gemsbok population was kept during each round (year) of play. A pattern of high population following rich resource years, and low population after reduced resources was evident when these data were graphed. A physical game can be used to simulate a concept that may be particularly difficult to grasp in the abstract. Here, wildlife population became quite clear to the conference participants from the antics of our own gemsbok. Students could extrapolate from this simulation what would happen to gemsbok numbers if less water and food are available in drought years, or how managed hunting would affect the herd.

Some games are so strong in the gimmick, however that the fun of the game overshadows the concept being taught. It is often important to check for understanding and make sure the students picked up the proper message.

The garbage shuffle

Rhythm and music can be a part of educational activities as well. The conference organizers demonstrated a rap about the history of rubbish, with conference participants joining on the chorus,

'Do the garbage shuffle, it's an age-old thrill,
cause we all make garbage and we always
will.

Participants enjoyed demonstrations of alternative methods of instruction with this puppet show by Tshomarelo Puppets.

Keep on truckin'

Using the example of the beer can, the participants helped Ulf describe the production pathway of that can, from the bauxite mine to the local store. A great many subject areas could explore various components of a product's life cycle: the production and disposal of hazardous wastes (chemistry and earth science), the price of the raw materials and final product (economics), the policies that enable multinational companies to do business (international policy and economics), and the transportation process at each stage of production (energy use and economics). Local products and imports could be compared for efficiency. Students can research their own choice of product.

Holey ozone

Cartoon descriptions of events, problems, or processes can be used to simplify a complex environmental issue. The destruction of the ozone layer by CFC molecules (wearing baseball caps until they are denatured by ultraviolet radiation) was shown in an overhead cartoon drawing. Visual aids of any sort are often helpful mechanisms for making a concept more clear. Cartoons are often overlooked in our attempt to accurately portray the scientific world.

Conclusion

This variety of teaching methods can help present information to students in interesting, entertaining, but still educational ways. Teachers have often commented that their job is made much easier and teaching becomes more fun, when they can infuse interesting and enjoyable activities into their day. Fun and interesting activities help overcome the potentially overwhelming impact of studying environmental problems. To learn that the ozone layer is being destroyed, or that garbage is piling up, is important, but to do so in a lecture could make the students depressed and hopeless. Presenting concepts in a lighter manner is one solution, as is remembering to teach about solutions, successful actions others have taken, and positive actions your students can take.



Education is often more effective if the students are involved—either by discovering a concept (such as the decrease in gemsbok numbers) or by making choices about what problem he or she will research in the library. These activities are also fairly good at connecting one narrow concept to another (the beer can pathway and the water cycle), creating a web of interrelated and interacting concepts.

Environmental issues cannot be solved by experts in one subject area alone. They are products of great interactions, and will be solved by the cooperation of people in science, social studies, economics, policy, culture, and art working together. Therefore, they should be studied in concert with several subjects, or at least addressed in an holistic context.

Planning for environmental education

Alistair Scott

Education Officer, World Wide Fund for Nature International

'Planning for environmental education' is one which covers a broad spectrum. It may deal with the planning required of the individual teacher in order to incorporate environmental issues into a sequence of lessons; the implementation of small discrete projects or address the development of a complete national environmental education programme. There are very different issues to be considered at each point in this scale.

I will start by making the assumption that, as this is a national conference, discussion should be restricted to the planning of a national programme.

Such planning is an enormous task. Therefore, I will be able to do no more than touch on the more important considerations. In doing so I will raise a number of questions and will not attempt to answer them fully. Although the core questions in planning are common to any situation, the reason is that the answers for an individual country will depend on a range of factors—social, political, cultural, environmental and economic—which are unique to that nation. So in this case, the answers must come from the people of Botswana who are to develop the programme. If environmental education was regarded as a subject in its own right, like maths or geography, there would be little difficulty.

The following sequence might, for example, be followed:

- A subject development panel would be established
- A syllabus would be formulated
- Textbooks would be written, tested and published
- Examinations would be devised, tested and set.

A clear course would be laid down for teaching and testing the subject; then a slot would be allocated in the timetable and pupils would dutifully (or otherwise) sit down to learn. In other words establishment of a new subject follows a well-planned and structured sequence of development.

However, because of its universal importance and the range of skills and knowledge that are needed, environmental education is most often dealt with on a cross-curricular and extra-mural basis by a range of different organisations. There is absolutely no doubt that is the correct approach—but there is a danger that, because of the breadth of the canvas involved, this approach can lack planning and direction that for example, the different environmental and educational organisations concerned will have their own areas of concern, their preferred techniques and their favoured target groups. These may overlap with others groups or they may not. Each organisation is likely to set to work dealing with the priorities as it sees them, planning its own strategy, producing its own outputs. Their motives will, doubtless, be impeccable but good motives are not enough.

In a badly planned programme there is likely to be duplication of effort and waste of resources. There is a danger that the audience, whoever they are, will receive confused, maybe conflicting, messages from several different directions. From this disorder is likely to arise disagreement, tension and even fierce competition. The resulting mish-mash will be difficult or impossible to evaluate and will have done little or nothing to help solve our environmental problems. Hence the need for a well structured and co-ordinated approach in the development of a programme; just as would take place with the development of an academic subject.

Most environmental education work, at whatever scale, seeks to raise awareness, foster knowledge, change attitudes and develop the skills to meet challenges posed by the host of environmental problems that beset us today. In addition, any project should aim to stimulate practical action with regard to these problems and there should exist the facility to evaluate the work at regular stages. (Figure 1)

These are the core objectives of any such programme. It is important to appreciate these and to place a weight on each aspect with regard to the different facets of the programme. It is also essential to deal with the practical aspects of implementation. And there are two quite

different facets that need to be considered—the managerial aspects and the educational and environmental aspects. It is essential to appreciate that these two facets are equally important. The most educationally sound programme, for example, will founder if its management is poor.

Management aspects

Control

This is the first decision that must be made when establishing a programme. Who is to take the ultimate decisions? Is it to be a government department, a statutory body, a Non-Governmental Organisation or a committee?

A committee is most often the favoured choice. If it is the one decided upon for Botswana then care should be taken in the composition of this committee. It must be large enough to be representative, but small enough to be workable. It should include representation from all bodies, governmental and non-governmental, for which either education or managing the environment is a principal reason for existence. But it should be composed of no more than one representative from each body. It should not include those groups or organisations for which education or the management of the environment are secondary or marginal concerns.

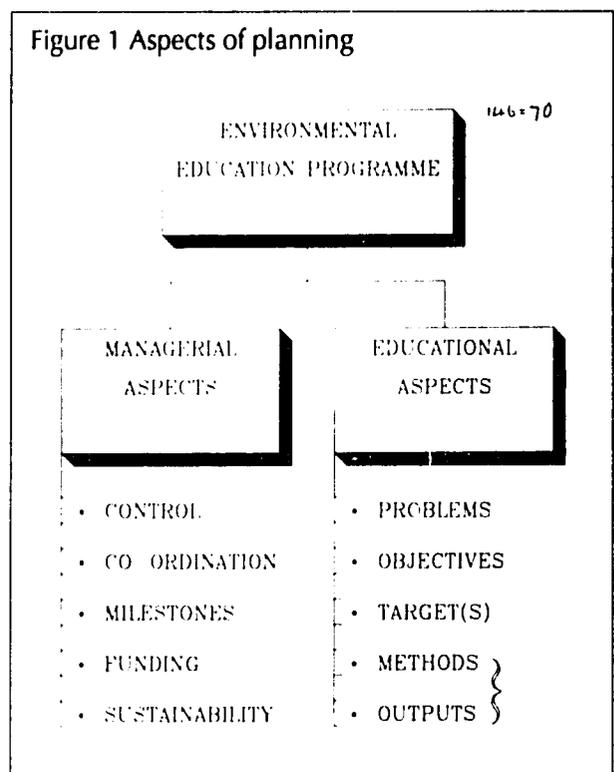
For the sake of continuity and informed decision-making it is essential that the membership of this committee be defined as precisely as possible. For example, rather than have '... a Representative from the Ministry of Education' listed as a member, it is better to have a named person from that organisation (or if that is not possible, a person from a named position within the organisation) appointed.

Coordination

Arising from the selection of the controlling body comes its first crucial management decision. How is the coordination of the whole programme to be effected? Is an individual to be appointed or is the job to be given to an interested organisation? Maybe a small 'Executive sub-committee' could be formed.

I, personally, prefer the selection of a full-time individual, an 'Environmental Education Coordinator' who is answerable to the controlling committee. This is a more 'active' approach. However, it needs a very special person for the job, someone who has an educational background but has strong management skills too. It may not always be possible to find such a person. In this case, further decisions have to be made. Should someone be trained for the job or should an alternative coordination method be used?

Figure 1 Aspects of planning



If an individual is chosen there is one small danger to be aware of. In my experience coordinators have often taken up their position feeling that they are personally responsible for carrying out the whole programme. This is not an auspicious way to start. The coordinator's task should be as much managerial as anything else; to act as the link between the controlling body, donors, and those actually doing the work. The coordinator should stimulate new ideas (in line with the overall plan), encourage and support the implementation of those ideas, ensure that the momentum of existing activities continues, manage funds and draw the programme together into a coherent whole. The actual work of writing materials, running workshops, setting up tree nurseries, or whatever, should be the responsibility of specialists (Government Ministries, NGOs, employed or seconded individuals, for example).

Setting 'milestones'

Having established the controlling body and determined the coordination method, the people involved should then establish 'milestones' for the programme. Milestones should not be confused with the objectives. Milestones are a management tool used to plan and measure progress. They may include such items as the establishment of formal agreements, the setting up of an office, the employment of staff, the start of a particular part of the project, the publication of a book or any other suitably identifiable point.

The setting of such milestones helps to clarify

the direction that the programme is to take. They are also markers, used to monitor progress which is essential for feedback to the controlling committee, coordination amongst participants and in reporting to donors.

Funding

The financing of a programme raises a mass of questions to which I can make only the briefest of references if this paper is not to become too long. Nevertheless, these questions are crucial and answers must be found if the project is to have a chance of long-term success.

First of all, who is to pay for the programme? Will individual organisations be responsible for raising their own funds or will there be a central 'pot' for the whole programme? How will the outputs be paid for? Will they be sold or distributed free? Who is to finance the position of coordinator, any ancillary staff and the office space that they will need?

Some of these questions need answering before the programme begins; others can be dealt with once it is running. Even so, right from the outset, a long-term view of the financial element of the programme must be developed.

If money is to come from donors, over what period of time will the support be provided and what will happen after that? There is always the danger that a project will collapse when external funds dry up. To be worthwhile, any project should either intend to become self-supporting or aim to develop local, long-term sources of funding within a fixed time-frame.

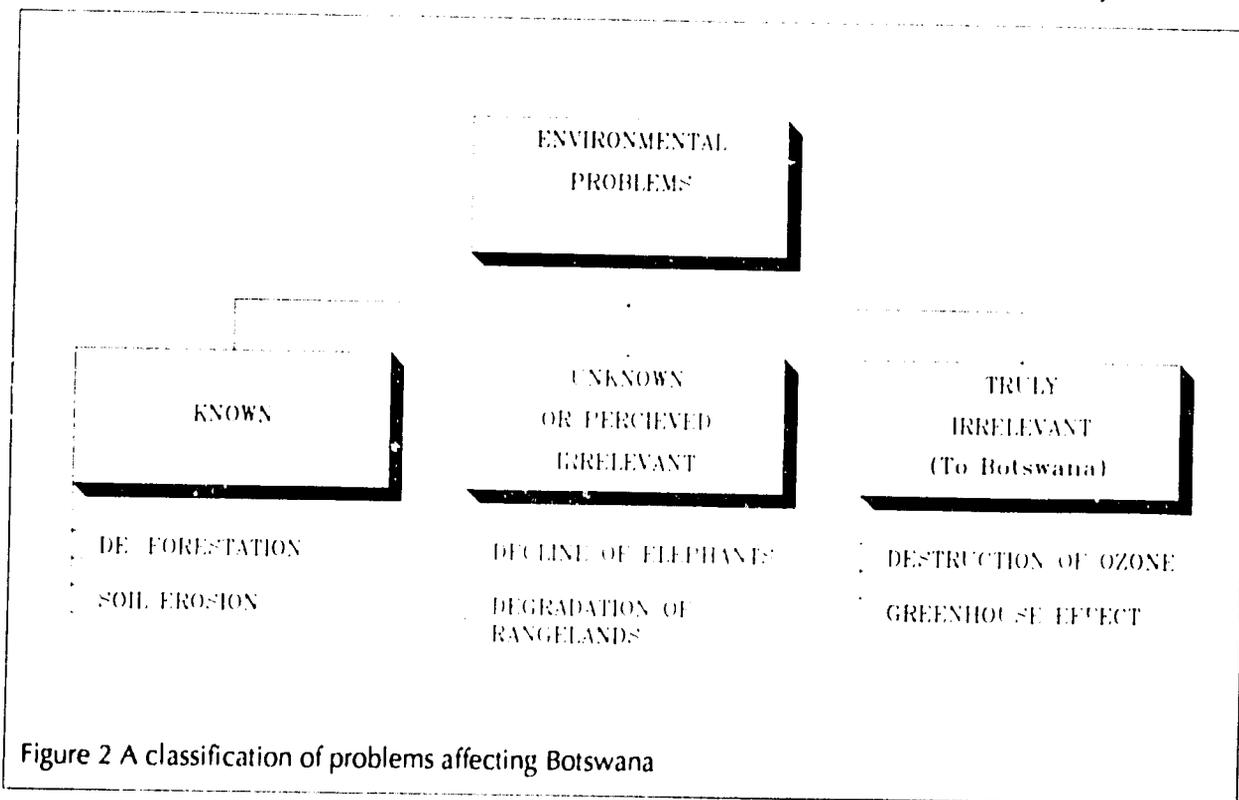
Sustainability

This last management consideration is one which is always mentioned when talking about environmental actions but is frequently overlooked when it comes to the management of projects.

By sustainability, in this context, I mean the establishment of programmes that become self-perpetuating with the minimum of additional input (this, of course, is linked to the long-term funding plans referred to above). Sustainability in the design of a project allows energies and resources to be directed towards the improvement and expansion of the programme, rather than just keeping it going.

A classic example is Chongololo Magazine in neighbouring Zambia. The magazine was set up with aid from WWF in the mid-1970s. It was established in a three-year rotating cycle so that after the initial development, new issues of the magazine did not have to be constantly written, edited and laid-out. From this, a similar and parallel rotating cycle of radio programmes was established. Both of these now continue, with the minimum of additional effort, supported by local funding. Small refinements have been made, such as the publication of a duplicated up-to-date Newsletter, the preparation of an Index and the distribution of file covers in which children can keep a set of the magazines. Most of these refinements are paid for with locally generated funds.

Meanwhile, the support from WWF is now directed towards the production of a sister magazine, Chipembele, for secondary schools.



This is also being designed with a view to sustainability, in a cycle of twelve issues. Once this is complete and running, a third cycle for senior secondary school is envisaged.

Educational and environmental aspects

The problems

It is now apparent to most people that we are spoilt for choice when it comes to selecting environmental problems to address in any project. So, in creating an Environmental Education Programme we must always be aware that there is a danger in trying to address too many environmental issues all at once. This can lead to effort, and cash being spread too thinly. An attempt to deal with everything simultaneously is likely to result in nothing significant being achieved.

In order to direct effort more effectively it is helpful to break down environmental problems into three broad categories with respect to the people of any given country.

Known problems—These are the problems which are closest to the population. The majority of people will be already only too well aware of them. De-forestation and soil erosion are probably two examples of grave concern in Botswana.

People have little or no need to be told about these problems. What they need is practical education and assistance with solutions. Dealing with these problems should be the highest priority in any environmental education programme

Unknown or problems perceived as irrelevant—These are problems which may occur at some distance from the community but are still of concern to a country as a whole. In Botswana, examples may include the loss of wildlife or the degradation of rangelands. People may first need to be made aware of these problems—or made aware that they are problems—and how they are likely to be affected by them. These problems are also important but should take a lower priority.

Irrelevant problems—The destruction of the rainforests, the loss of the ozone layer and global warming, profoundly serious though they are, have no immediate relevance to Botswana. The country is neither responsible for them, nor can it do much about them. Addressing this category of problems should never be allowed to dilute the more pressing issues outlined in the preceding two categories.

Objectives

Having identified the problems that need to be addressed it then becomes necessary to define the objectives of the programme with regard to these problems. Objectives are essential to give

the programme direction, purpose and to permit evaluation. However, this is one of the most delicate tasks in the planning process.

The principal factor to consider is that objectives must be attainable. It is counter-productive to set objectives that are too ambitious and can never be achieved. This will only lead to disillusionment and loss of momentum. Equally, objectives should, as far as is possible, have a positive environmental impact. Unfortunately it is often the case that the objectives with the greatest environmental significance are those most difficult to achieve. Clearly a balance must be struck.

To give an example the loss of woodland cover is one of the most serious problems throughout this region of Africa. Any environmental education programme is likely to address this: but to what end? A range of three objectives can be used to illustrate the dilemma. A programme could aim to achieve any one of these as its ultimate goal:

- The production and distribution of educational materials dealing with deforestation.
- A measurable increase in awareness of the problem amongst pupils, teachers or the local community.
- The actual halting, or reversal, of the loss of trees within the area of the programme.

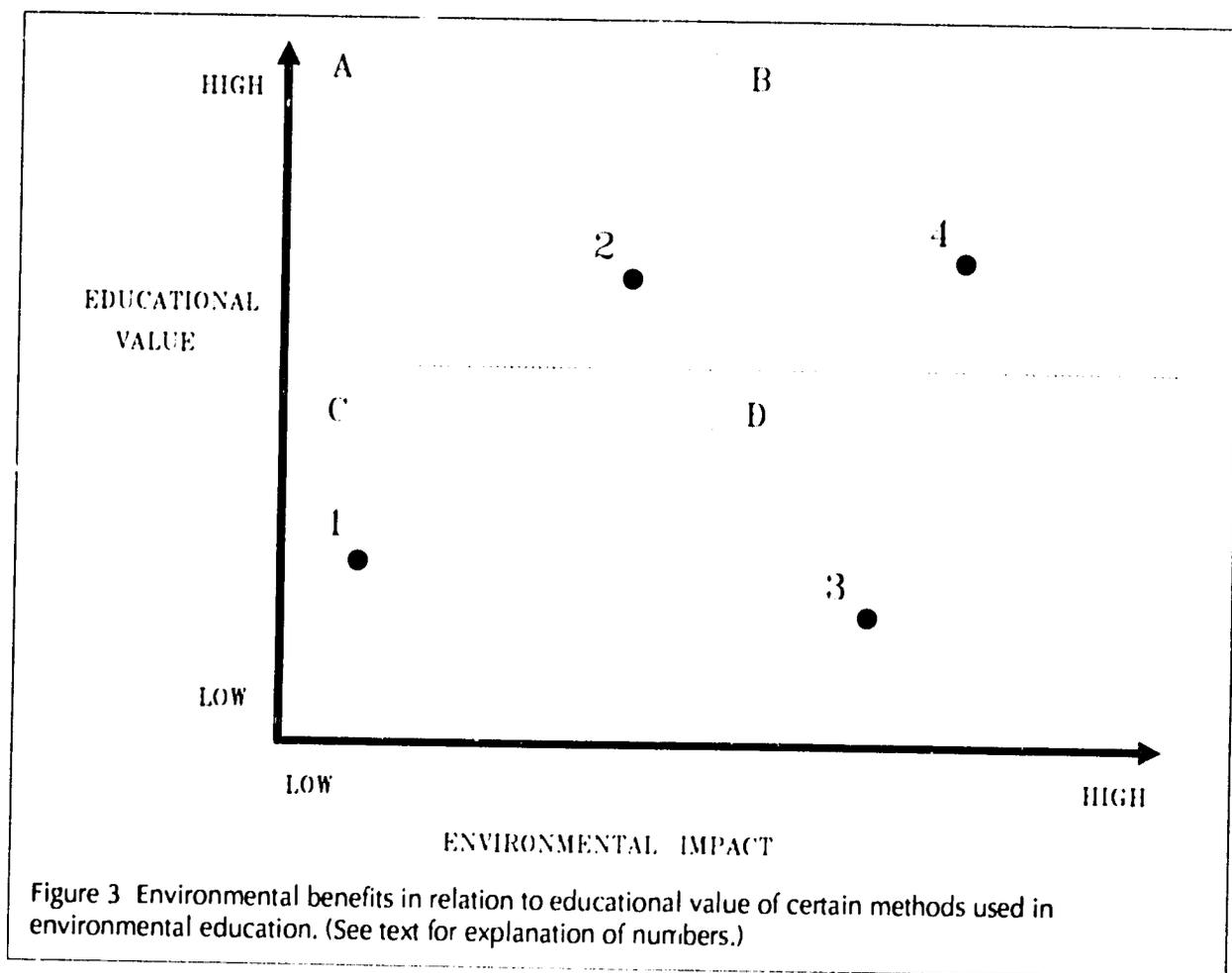
Given sufficient resources the first objective should be relatively easy to achieve—but is it a sufficiently worthwhile target?

The second objective is better. However, it is obviously futile to have raised awareness if the rate of deforestation shows no sign of declining. The last objective is the ideal one but (if we are candid) it is unlikely that an education project alone could bring about this desirable state of affairs. This indicates another crucial factor to be considered in the setting of objectives—that of integration with other environmental programmes. The third, most desirable objective, could be most easily achieved if the programme worked in conjunction with, say, a Forestry Department re-forestation project.

To summarise—the setting of objectives is crucial, but they should be attainable, worthwhile and should integrate with other environmental activities being run by other agencies, whether these activities be throughout the country or in one community.

Targets

At whom is the programme to be aimed? Targets usually identified are the formal education sector at primary, secondary and tertiary levels and teacher training; and the non-formal sector—community and religious groups,



youth organisations, decision-makers and any other grouping outside the formal education system. Ideally the whole range should be targeted, but there are very likely to be financial, resource or personnel constraints to this ideal. Then decisions will have to be made, based on the following considerations:

- The problems to be addressed and the objectives that have been decided upon.
- The organisations involved in the programme and their areas of operation or spheres of expertise.
- The resources available.
- Parallel work being carried out by, associated organisations.

With limited resources it is often recommended that the 'multiplier effect' be utilised—training teachers rather than dealing more directly with pupils for example. However, if teachers then return to poorly equipped schools they may lack motivation—especially if they have come from a well-equipped training establishment. In a case such as this it may be better to target the schools themselves.

Methods and outputs

The formation and support of wildlife clubs, the production of radio programmes, the stimulation of tree-planting campaigns, the writing of newspaper columns, the showing of videos and the publication of schools textbooks are all examples of possible methods/outputs that could be part of a national environmental education programme. All are useful but some have a greater value than others.

With limited resources, priorities must be set and choices must be made, based on these relative values. The overall worth of any method or any output can be roughly assessed by plotting environmental benefits against educational value using a simple matrix. The following examples, connected with trees, are plotted on the matrix (Figure 3)

The points represent: 1. The showing of films and videos on deforestation using mobile units. 2. The production of a children's magazine dealing with deforestation issues. 3. A campaign to persuade children to plant two trees each in their school grounds. 4. The planning and establishment of tree nurseries, by children, in every school.

Though the assessment of the environmental and educational value of such projects is necessarily subjective, the use of this simple classification process enables the more beneficial methods and outputs to be identified. Obviously, projects which fall into Sector B (high educational value and high environmental benefits) are the best, followed by those in sectors A and D.

In the process of selecting methods to use, or outputs to produce, we should also be aware of another danger—the glamour of modern technology swamping the simple value of traditional means of communicating and educating.

The showing of a film or video is all too often seen as superior to locally produced drama, the singing of ballads or story-telling around a fire. Yet these simple and familiar methods of communicating ideas are invariably more effective. Information imparted through these traditional means is better understood, better related to by the audience and better acted upon than a 'high-tech' show in which the medium swamps the message. The value of the traditional approach must never be forgotten.

As I pointed out at the start, in this paper I have raised many questions—and given almost no answers.

The questions are the ones that need to be asked during the establishment of any environ-

mental education programme, wherever it is based. The answers, in this case, will be unique to Botswana. I hope that these unique answers will be discovered as a result of this conference and they will lead to a well-planned and effective environmental education programme for the country.

Careful planning and foresight are the prerequisites of any venture. I have broken down the planning process into discrete boxes in order to highlight the steps involved. However, at the same time I have tried to indicate that these processes are closely linked. When planning a programme it must be viewed as a whole as well as in its parts.

When crossing unknown country the wise person follows a map. The marked route may have to be changed because of flooded rivers, impassable roads or broken bridges but the map is on hand to guide the traveller in these difficulties.

Similarly, an environmental education programme may change and evolve as it develops. Nevertheless, the initial careful planning will have established ('mapped') the guidelines to see it through any difficulties that may arise.

There is no doubt that planning and coordination are essential. An unplanned and uncoordinated programme is, unfortunately, likely to create more problems than it solves.

Experiences in environmental education in primary education in Botswana

Sandra A Shaw

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Introduction

The Outreach Programme, initiated by the United Nations Environment Programme, is a coalition of local, national and international organisations working to disseminate information on environmental and health issues. I was recruited in 1988, for two years, by the United Nations Volunteer Service as Outreach Co-ordinator to implement the project in Botswana. The Kalahari Conservation Society was the receiving agency and the project was supported by the Ministry of Education.

The major objective of the project was to raise awareness of the environment among teachers and pupils at primary level through a number of activities. Unfortunately, from the beginning, there were communication problems between UNEP on the one hand, and the Ministry of Education and Kalahari Conservation Society on the other. It eventually became necessary to draw up an in-country project based on the original terms of reference and the co-ordinator's experience so far. This project was then renamed Botswana Environmental Education Project (BEEP). Donor agencies were approached to support the Project and a positive response was received from NORAD.

The revised tasks for BEEP were:

- to establish a network for the distribution of Action Magazine and other environmental education materials.
- to participate in and eventually conduct in-service workshops for headteachers, teachers and education officers.
- to visit schools to assist with the integration of different subject areas into environmental education
- to support innovations such as Project Method and Breakthrough to Setswana.
- to act as resource person at the Curriculum Development Unit and assist officers in incorporating environmental education into their subject areas
- to liaise with CDU, MOE and KCS through membership of the Environmental Education Reference Group.
- to try to reach children who are not part of the formal education system, through liaison

Environmental Education

- with other projects in the non-formal sector
- to develop resource materials such as a Teacher's Resource Handbook for environmental education

Since the core of the project involved the formal education sector, I felt that I could achieve these aims more effectively from the Curriculum Development Unit of the Ministry of Education as well as from the Kalahari Conservation Society. I considered it to be most important to have the fullest support from the Ministry of Education for the project to be successful.

Implementation

Liaison

It was clear that there were different organisations involved non-formally in environmental education in Botswana. The Kalahari Conservation Society had initiated the formation of the Environmental Education Reference Group involving such groups to co-ordinate activities and ideas. I found this group to be a valuable resource for information and for sharing experiences.

Members represented organisations such as the Forestry Association of Botswana, Thusano Lefatsheng, the Wildlife Clubs Association of Botswana and the National Museum, among others. I was keen for teachers to be aware of these extra resources and therefore promoted their activities at workshops. The group has compiled and produced a booklet for teachers called "Teaching Aids and Resource Materials Relating to the Environment". This guide was dispatched to all schools and has recently been updated and reproduced with assistance from Swedish Society for the Conservation of Nature.

The Wildlife Clubs together with KCS and BEEP launched an annual National Conservation Art and Essay Competition for all levels in the formal education sector. The response was very good and entries were received from all over Botswana. Winning entries have been received from the remoter areas of the country such as Shakawe and Etsha.

Soil concepts are much easier to put across when they can be demonstrated in the outdoor classroom.

Action Magazine

Action is an environmental health magazine which is developed in Harare. Action was established in response to a UNEP initiative through the Outreach Network to establish an environmental health magazine for school children aged 9-14 in Zimbabwe, Botswana and Zambia. The magazine also includes instructional materials oriented for the use of untrained teachers in the three countries. Action was first conceived as a regional magazine. The topics and issues covered are regional by nature and are directly related to common issues in the school syllabuses. Action therefore supports the official school curriculum as supplementary, user-friendly environmental education material.

Initially, Action Magazine was sent out from the KCS with the help of the CDU. Assistance was given by the MOE in providing a computerised, updated list of school addresses in the country. Later, the operation was moved to the Curriculum Development Unit to ensure continuity despite possible staff changes. A competition accompanies every issue and response to this has grown enormously. Many students from schools all over Botswana have been successful and have been rewarded with Action T-shirts and extra magazines for their schools.

Feedback about the usefulness of Action in the classroom was very positive and I requested further copies from Harare so that each primary school could receive ten copies each. I also sent three to four copies to Community Junior Secondary schools. Reference copies were sent to Education Officers, Teacher Training Colleges, Educational Broadcasting Unit and other establishments. During subsequent workshops, it was found that many teachers had not actually received the magazine. Follow-up investigations revealed that many copies arrived at the school but remained on the headteacher's desktop. A circular from the MOE encouraged headteachers to pass the magazines on to the teachers. Teachers also requested assistance in how best to use the magazine in the classroom. Time was spent at workshops throughout the country on how best to use Action in schools, given the limited number of copies available. Some primary schools have over 1 000 pupils but few have enough classrooms to comfortably accommodate such numbers.

In order to ensure that Action was being used effectively, I invited schools to nominate an interested teacher to be Action Co-ordinator for their schools, involving responsibility for the



distribution of and access to the magazine. I was thus able to meet interested teachers who had responded positively and have been working with some of them ever since.

In order to promote Action as a more regional magazine, a writers workshop was held in Harare in 1990 to plan and organise writing for future editions of Action. Participants from UNEP Nairobi, WWK (UK) Zambia, Zimbabwe, Lesotho, Swaziland and Botswana identified twelve topics considered desirable content for future issues. These topics were to be relevant to all the SADCC countries and were to fit into or extend the present curricula. It was agreed that each country organise an editorial team to research and write two of the issues over the following three years.

We were introduced to the steps in magazine production and then in mixed-country groups we wrote an issue on Pesticides. After brainstorming the topic, themes were selected and allocated to pages and then this written work was allocated to mixed-country groups for input. The writers indicated what was required for illustration and the Action team then worked to put together a draft copy.

The three Botswana representatives from CDU formed the core of Botswana's writing team. They were joined by teachers and education officers and worked together to produce a draft on the challenging topic of Ecosystems. This issue was then sent to Harare for editing and illustration and is, we understand, due to be published in the coming months. Our remaining issue to be written is on School Gardens.

The workshop was a valuable learning experience as well as an excellent opportunity to meet colleagues involved in environmental education in the region and share experiences.

Workshops

In-service training for headteachers and teachers throughout Botswana had been facilitated through the Primary Education Improvement Project at the University of Botswana and the In-Service department of the Ministry of Education. Given that environmental education is not considered to be a separate subject at this level, the co-ordinator decided to participate in, where possible, subject workshops already in progress as well as national workshops set up to disseminate information on new MOE initiatives such as Continuous Assessment, the Project Method of teaching and Breakthrough to Setswana.

I became involved in as many workshops as possible, and was given time to present information about environmental education through lecture, video, discussion and displays of available environmental education materials, such as

Action, Outreach and We Care. I took the opportunity to work with teachers as to how Action magazine and Outreach materials could be used in the classroom in conjunction with the syllabus.

Such occasions were also learning experiences. On one occasion, I was invited to contribute to a workshop on the Project approach. Groups of teachers were busy planning their topics and activities. I joined a group who were working on 'The School Grounds'. The first activity was an observational walk around the grounds. The teacher was very well organised and the children were well equipped with clip boards and pencils. They were asked to observe their surroundings and note down what they could see. I was very surprised when the children noted only buildings, people, fences and the odd tree to record. I realised at that point that children need to be taught/guided to develop their observational skills and that this is an important foundation for environmental education at primary level.

I had enlisted the help of six interested, enthusiastic teachers who had contacted me to act as an environmental education reference panel. They were able to review and try out materials in development, as well as to contribute toward the design and execution of specific workshops for environmental education. Together we launched two major workshops in the Kgatleng and Kweneng districts for teachers. Here, we promoted environmental education as being an approach to learning and not a separate subject and worked with the participants on a hands-on, discovery approach to the environment. The week-long workshops focused on information and activities of benefit to teachers in promoting environmental education in their schools. I deliberately encouraged members of the panel to conduct aspects of the workshops themselves in order to feel involved and thus committed as well as to gain experience.

Teachers were also given information about organizations involved non-formally in environmental education such as the Forestry Association of Botswana, the Wildlife Education Unit and KCS. They were invited to present their activities to the teachers with a view to assisting them in carrying out environmental education activities in their schools. Such assistance was offered by means of giving illustrated talks to teachers and pupils, providing printed information and having on-site demonstration activities such as seed collection and germination, tree-planting and care of young seedlings. Teachers were encouraged to develop Wildlife Clubs in their schools in order to pursue environmental education activities and further raise awareness of the environment among both staff and

pupils. Through the Environmental Education Reference Group, these organisations produced the "Teaching Aids and Resource Materials relating to the Environment" booklet.

During the workshops, teachers especially enjoyed a day devoted to the exploration of natural surroundings during which we focused on skills of investigation, observation, identification and classification. Teachers were given a worksheet guide to explore the environment using all their senses (apart from taste) as well as the intellect. A substantial amount of time was spent on the affective components of teaching and learning through description and appreciation of the natural world in balance and people's effect on this balance.

When we returned to the "classroom", teachers organised their collected findings into displays that demonstrated what they had discovered and how they wanted to use the information. We had information on medicinal plants, insects and birds, soil and pollution including charts, graphs, games and models. The whole exercise was designed to be easily replicable with their own classes in which children were encouraged to discover/explore by themselves using their own life experiences as a foundation on which to build. The teacher's role is considered that of guide to organise and structure learning outcomes.

We also spent time setting up nature trails around the Centre, guiding the learner to find out information about the natural environment and relationships therein. Again, this exercise was carried out so that teachers could, with the children, develop such trails in their areas for their schools.

Through actively working in his natural environment, and participating in its changes, the child should come to experience plants, seeds, insects, patterns and eventually relationships in nature. It is only through developing an understanding that the child can come to appreciate and desire to protect his environment.

The syllabus

One of the major concerns of teachers is adequately covering the content of the syllabus. It is important to note that schooling is often seen as a path to upward mobility and that exam success is of the greatest importance. Innovations are met with suspicion because they are seen as extra input into an already overloaded curriculum but also because teachers are not confident in skills and methods necessary for implementation.

During the workshops, demonstration integrated lessons on topics of plants and soil were presented, using children from local

schools, to show that the content can include more than one subject area at a time. As adults, we do not experience the world in compartmentalised subjects. For example, in examining the topic of soil erosion, children can at once experience social studies, mathematics, language and agriculture concepts. They will need to ask why and how the soil is being lost? How much is lost over time? What does the area look like? Where it goes? What are the effects on the agricultural potential of the land? What are the consequent effects on people's lives today and in years to come?

We studied our syllabuses for examples of objectives and content which could be covered using the environment as a teaching resource.

In the Kgatleng district, an enthusiastic group of teachers who had attended the workshop formed an Environmental Education Committee and actually conducted another workshop for teachers from three schools in their area. They eventually combined with the Project Committee and are active today at the Mochudi Education Centre.

Environmental study areas

I had noticed in travelling around Botswana that primary schools were commonly deficient in classroom accommodation. There are however large areas that constitute the school grounds. These areas serve as playground, "classrooms", and outside kitchen yet there is often plenty of space to spare. In order to make environmental education meaningful, the environment itself needs to be utilised as an outdoor classroom.

Such areas could, I felt, demonstrate concepts of interdependence in action and through understanding this micro-environment, come to apply their knowledge to a larger picture of the world. Through using such an area for learning, it is hoped that pupils, in working together, develop positive attitudes of sharing and cooperation whilst involved in problem-solving activities. Together with input through the syllabus and supplementary materials, it should be possible to encourage the development of desirable behaviour patterns which will eventually be called into play later in their lives, for improving and protecting their environment.

It was appropriate to try to develop "outside classrooms" in the form of environmental study areas. Initially, I worked with a teacher and her class to develop such an area. The area was selected close to the school garden and we began by mapping the site. We worked together to select components to be developed on their sites. Pupils selected groups to establish a compost pit, a weather station (for which they were to make the instruments), a rocky habitat, a soil pit, a soil erosion demonstration area and a

waste water area in which to grow fruit trees.

I consciously tried to prompt the participants into formulating their own ideas so that the product would be more likely to be sustainable. They had to feel that they "owned" the area and that its development was theirs. My role was to supervise and to guide. This meant that the pace of development has been quite slow, but, I hope more sustainable in the long run for future groups in the various schools. Such study areas would differ in design throughout the country in response to local conditions.

In working with a group of children in Lobatse, I learned that traditionally our children have a wealth of environmental knowledge that can be encouraged. We were discussing a wild area that they had decided to leave in its natural state and observe ecological processes taking place over a period of time. There were many wild plants being fed by water from a leaking tap. I became enthusiastic about finding out the names of the plants and their possible uses and building up a school herbarium. Whilst I was working on means to find the names, the children looked very amused and were able to name each and every one of the plants, as well as tell me what they are used for in different parts of the country! We then worked out a method of classifying this information by making information charts about the plants.

The class, in groups, produced many charts which we used later at workshops. Furthermore, it became clear that the pupils responded positively because their experiences and knowledge of their environment, learned primarily from their families and community, was being validated and extended. Such learning is therefore seen as culturally real and relevant to the child's life and is thus well received and moreover, likely to be supported by the community.

The basic components are now in use. Other classes in the school use the rockery, for example, when teaching about reptiles since they are generally present in this habitat. At present, the group, together with the teachers, are looking into the establishment of new and exciting projects. One of these is to establish a tree nursery with a view to supplying other establishments with established seedlings. This is based on the highly successful and valuable Green Belt Movement in Kenya. It clearly supplies extra motivation to care for the seedlings and to find the most effective ways to help them to grow, given Botswana's unpredictable and low rainfall patterns. Other areas are keen to keep some livestock such as small mammals or birds, tackle the problem of waste disposal, and design appropriate technology, for example, grain storage.

Curriculum development

My role at CDU was that of resource person. The process of curriculum development takes a long time. It seemed that the most effective way to include more environmentally-oriented concepts and activities into the curriculum was to work with subject officers by providing multi-media resource materials to encourage them to make necessary additions and adjustments to their syllabuses in the shorter term.

I carried out a situational analysis of the syllabus to establish how far topics exist relating to the natural world and man's interaction with his environment. I found much material which I felt could be extended/adapted to include objectives, content and activities in environmental education. This was to form the foundation of the Teacher's Resource Handbook which is planned as an environmental-education extension of/supplement to the current syllabus and discussed later in this paper.

Radio

Since the radio is an effective means of disseminating information nationally, I approached the Educational Broadcasting Unit with Action and the Outreach materials in the hope of encouraging and assisting writers to enrich the radio programmes for schools with added conservation-oriented content. I was asked to assist them in developing programme content for upper primary Science on conservation-oriented topics which teachers were having some difficulties with. These topics included plants, soil, food chains and webs and animals. This was successful and we were able to publicise the availability of Action magazine and further information on environmental education from BEEP. This is one way in which the out-of-school population could be reached.

Materials development

The project was provided with a complete set of Outreach materials. These are copyright-free adaptable materials containing information on environmental-health issues from other countries both more and less developed. Outreach has been used to develop children's magazines such as Action and Pied Crow in Africa and Asia.

I had used examples from the various packs at workshops to demonstrate how they could be used. Teachers generally found it difficult to see the relationship between the materials and the syllabus that they had to use. I reproduced issues on Water and Soil and distributed them to the Education Centres throughout the country for use by teachers with an offer to provide more on request. I received little response mainly, I feel, because the potential of such material needs to be demonstrated to teachers in order for them to

Delegates visited the site of Bokaa Dam, a new construction designed to provide water for the growth of Gaborone.

be utilised.

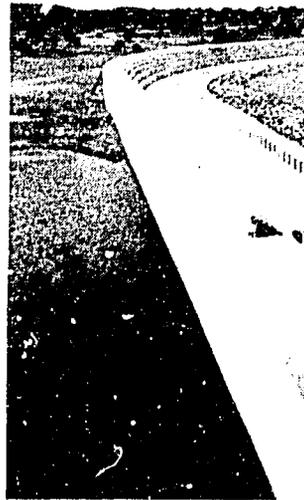
It became clear that materials more specific to teachers in Botswana were necessary. The Teacher's Resource Handbook for environmental education was thus designed on the basis of our ongoing experiences with the syllabus, teachers and pupils. It was felt that much information was needed on the different topics and ideas for activities that teachers could carry out with their pupils, as well as strategies that could be implemented fairly easily in schools to facilitate and encourage education about the environment. Subject officers at CDU provide critical support through a reference group which reviews each unit.

I felt that in demonstrating to the teachers knowledge and understanding of the syllabus, they would be more open to include environmental education both in content and as an approach to learning. I had also become aware that whilst there exists valuable material in the Teachers Guides (currently being updated from issue in 1982) for subject areas, teachers, understandably, do not consult guides for Standards other than the one they are teaching, yet these guides can provide stimulus for teaching ideas and reinforcement of basic concepts already taught.

The book is cross-curricular and comprises 7 units on the following topics: soil, water, trees and plants, population, fuel and energy, pollution and wildlife living together. Each Unit contains Teacher's Notes which include 8-10 major concepts and attitudes to be covered through carrying out a variety of activities, many of which link the school with the community. Assessment ideas follow each set of activities.

It also contains information on Botswana's environment, environmental education and strategies for the implementation of environmental education in schools. There will be a picture case study of two young people growing up in Botswana, to illustrate progress through following desirable and undesirable environmental management practices. It is hoped that this story will demonstrate in action, the major concepts and attitudes which appear in the core units. This component may be adaptable for use in literacy classes.

In the classroom, it is foreseen that any teacher, from Std1-9, should be able to find straightforward information and activities on environmental topics to use with his/her class in virtually all subject areas to support and extend



what is being taught from the syllabus.

During the project, I collected a number of reference materials on environmental education and these are now housed in the Resource Centre of the Curriculum Development and Evaluation Department for the use of officers in developing their curricula.

Some observations on BEEP

Constraints

There were initial problems with UNEP in establishing the direction of the project and this certainly delayed an effective beginning. It also meant that the project really only ran for eighteen instead of twenty-four months. This was unfortunate because a level of awareness and expectation had been reached among teachers, as evidenced by the requests we were receiving for assistance through further workshops and materials. It was frustrating not to be able to plan positive responses to all such requests, given the level of interest and enthusiasm.

Members of our panel were able to meet some requests but difficulties arise when such in-service activities conflict with their normal classroom duties. This matter is under discussion.

In general, I felt that teachers found environmental education as an approach to learning,

and not a separate subject, rather challenging as it differed from the teaching methods most of them had received in their pre-service training. We found that they were not confident in using more innovative approaches to teaching unless they had had some experience of the Break-through and Project methods, despite the fact that they have knowledge and experience of the environment.

Many assumptions are made about the teacher's readiness to adapt to such innovations. Whilst the teacher may be eager and willing to try such methods, inexperience in training and practice in the necessary accompanying approaches may affect such efforts adversely, lower self confidence and thus discourage further attempts. There are not, as yet, enough official support materials in the field to encourage innovation since curriculum development and revision is, by nature, a lengthy process.

Furthermore, teachers are, understandably, under pressure to produce good examination results and following the syllabus content carefully is considered the best way to achieve good passes. There was much enthusiasm when teachers found that they had actually been covering environmental education and that through using the natural environment to teach, they were actually meeting many existing scientific, agricultural and social studies objectives.

Moreover, many teachers are working with large classes outside in the school grounds since there is inadequate classroom accommodation. Again, teachers are committed to teaching the syllabus as effectively as possible under difficult physical conditions and may feel unable to attempt topic or theme work or using the environment.

Neither the status of environmental education or the profile of the project at that time was high. Environmental education was also in competition for attention in the syllabus and among teachers with other innovations such as Guidance and Counselling and the Project Method. Teachers therefore considered these initiatives as extra workloads. I suggest that future projects in environmental education in the formal sector command a higher official status and profile so that necessary innovations and adaptations both in content and method may then be effected in the teacher training, curriculum development and national examinations.

Conclusion

Despite the fact that BEEP ran for a short period of time, much is still in place. At the end

of the project, in November 1990, the Teacher's Resource Handbook was in its infancy. Requests to complete the task were favourably received and the first draft is now nearing completion. It is being produced in-house at CDU with support from USAID. The distribution and coordination of Action magazine is now undertaken by the Senior Science Curriculum Development Officer and, as such, has become an official, long-term activity at CDU.

Those teachers who had been involved in the project have maintained their enthusiasm and commitment. They themselves receive requests to assist other schools in the development of Study Areas and are eager in their response. The same teachers in addition to some new members, are still functioning as the environmental education panel. Through this panel, they are assisting with the development of the Teacher's Resource Handbook with contributions, trialling and evaluation.

Arrangements were made for one member to attend a three month certificate course in environmental education at Jordanhill College of Education in the UK. Since his return last year, he has continued with in-service work in his district and outside. This is very encouraging although not ideal because so many requests have been received that he has to balance them against his own teaching load.

Another member of the panel has recently left for the same course and hopefully will be able to assist in in-service in her district on her return at the end of the year. I am hoping that we can eventually establish a cadre of teachers in the districts who have been exposed to both the theoretical background to environmental education and also who have had some experience in implementing/teaching environmental education in schools across the country.

The Educational Broadcasting Unit have continued to be very supportive in publicising the annual National Conservation Art and Essay Competitions and have been happy to relay the results over the air as well as to read out the winning essays.

My experiences were very positive, responses enthusiastic. I am convinced that teachers and children in primary schools in Botswana have valuable knowledge and experience of their natural environments. It is time to convince them that this knowledge can form a solid foundation for teaching and learning through a problem-solving approach and the development of positive attitudes, by accordng environmental education greater emphasis across the curriculum, and validating its importance by including its concepts and objectives in national examinations.

The role of non-formal education in environmental education

Nnagolo Lucas Tau

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This presentation is based on the National Conservation Strategy for Non-Formal Environmental Education Document which clearly spells out the role the Department of Non-formal Education can play concerning this very important national issue.

We take delight in reiterating the conference objectives because they make good logical sense, indeed they table for discussion very pertinent issues; those that if not taken care of would impinge on the development process. Inaction in matters involving our fragile environment may bring tragic consequences. It is true that "the earth's resources are sufficient for all living creatures's needs, if they are managed efficiently and sustainably". But it is imperative that our environment especially in Botswana is seriously thought about in order to avert catastrophic. It makes good sense to prevent damage rather than wait for damage to occur and then embark on a difficult (if not impossible) restoration process.

First of all let us talk about the role the Department of Non-Formal Education can play. I believe the Department has a special role to play in that it is an enabling organisation because of the crucial role literacy has in communication. Here I am thinking of the crucial role education has in any society. An education system has the potential to play an important role in developing the kind of society a country wants to have. Literacy in this context is vital because apart from being a basic human right, it expands an individual's choice, control over one's environment and allows for collective action, which otherwise would not be possible.

Literacy is a tool for the success of other development programmes by improving communication skills and making it possible for people to acquire useful information. Above all, a literate individual will assume greater powers of communication, critical consciousness and control over his environment.

The Department of Non-Formal Education has great potential in disseminating information through its functional literacy activities. The content of the primers and follow up booklets is built around the problem identified in develop-

ment plans based on social, cultural and economic issues that take into account geographical and environmental differences in the country. Learning groups facilitated by literacy group leaders engage in discussion and action based on such key words as *leuba* (drought), *dikgong* (firewood), *malele* (littering) and so on. The Literacy Group Leaders, forming the important link here could be brought together through workshops and seminars where relevant issues pertaining to environment could be discussed. The literacy group itself constitutes a ready group of people who no longer have to be mobilised but are just keen to continue learning. This then would create an ideal situation to begin discussion on environmental problems and issues. The Department is planning with other agencies to conduct writers workshops for the development of reading materials on different topics that would include environmental issues. Since the Department of Non-Formal Education is represented in the National Conservation Strategy Coordinating Committee, we believe the issues under discussion at this conference will be adequately covered and the general public would expect to see numerous booklets on environmental problems published in the not too distant future. The current and new readers we have in mind are members of the general public who in most cases dwell in the rural areas and who on a daily basis have to make decisions that greatly affect our fragile environment—for instance felling of trees for different purposes, firewood collection, livestock grazing and ploughing.

Education's role in development is crucial here because we are talking of large numbers of people who are either illiterate or semi-literate adults, many of them working on the land who are already set in their traditional ways. Here we are touching on a very important aspect of education—the changing of attitudes. Many educationists would agree that the liberation of people's minds is an important component of education because this is really what non-formal education is all about; the liberation of a person to become a fully functioning member of the society. Education should be seen as teaching

people to look after themselves better.

Literacy is an essential part of non-formal education; an instrument through which other skills can be acquired; and essential for acquiring more rational attitudes in all human relations. It is believed that literacy is one of the major instruments for the development of human skills and abilities especially for those who have not had that opportunity to enrol into the formal school. Adult literacy again gives all members of the society the ability to communicate by the written word and in so doing fully participate in all aspects of the society.

Other non-formal education technologies that could be used to disseminate information should take cognizance of the varied reading levels of the clientele and also the strengths and limitations of the media used. In other words, a combination of the available media of communication is advocated. Some of the methods that have been used in Botswana with a fair amount of success are as follows:

- radio and cassettes have been used to reinforce printed materials
- popular theatre and drama could be revived to perform village drama which could be watched live or recorded for listening to over a radio
- the *kgotla* as a forum for community consultation and debate is one resource that needs to be extensively used for mobilisation and educational purposes.

The best development communication agents are the members of the local community themselves. Village people will often accept the advice of informal community leaders rather than the word of government officers.

Let us now for a moment look at the environmental problems facing Botswana. The Ministry of Agriculture is at present trying to explore ways of using Botswana's fragile grazing and arable resources without causing too much long-term damage. The Department of Wildlife and National Parks emphasises careful management of the wildlife resource. One corrosive issue that we face is that of desertification. This is mainly caused by the indiscriminate cutting down of trees by the people; this problem needs to be watched closely. Indeed it merits urgent attention. The mineral resource which is non-renewable requires careful planning. Another most serious of our environmental problems in Botswana, which will soon reach crisis proportions, is that of litter. Our surroundings may become our major problem in another generation at the rate at which we are filling it up with all kinds of junk. Very serious attention is required here. With this one almost everybody is a culprit.

People will have to cooperate on this one because harsh penalties alone will not do the trick. The heart of the problem lies in the fact that there is very little knowledge and information that would make the general public environmentally knowledgeable, skilled and dedicated citizens who will work together (or at best individually) towards a situation where there will be a balance between quality of life and quality of environment.

Then the question of the target population also needs to be considered because conservation really is everybody's business and it should be emphasised that everybody can contribute significantly to a better quality of environment. It may be necessary to mention the main target groups that could be at the forefront of the recipients of an environmental education programme. These would include:

- political and traditional authorities and development workers,
- children still at school,
- children and adults who have never been to school,
- participants in the National Literacy Programme,
- special groups like grass cutters, wood cutters, hunters, and those who gather resources for commercial purposes.

The coordination aspect of the whole programme is very important and this is where government departments as well as non-government organisations will come in. Closer coordination among all agencies involved in environmental education is vital—in fact as mentioned earlier the issue of the environment should be the concern of everybody and everybody should be prepared to contribute towards a better quality of environment. It will be seen from this that environmental education is a concern not only of the Ministry of Education but of every Ministry of Government, and it is important that all ministries view it this way because this will make things much easier. The Ministries of Agriculture, Health, Commerce and Industry, Local Government, Lands and Housing, Mineral Resources and Water Affairs, to mention some, should be fully involved because they deal with a wide spectrum of the population. And added to all these we also have non-governmental organisations like trade unions, political parties, churches, women and youth organisations, commercial organisations and so on. It cannot be over emphasised that coordination on an issue as important at the environment is so vital if indeed we are aiming towards a better quality of environment. Thank you.

The need for coordination

F M Leburu

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Introduction

From this week's discussions a lot has emerged that calls for a need for effective coordination among programmes addressing environmental issues. To mention a few, the following observations came up during the discussions:

- Environmental issues affect all of us and we are in one way or another aiming for the common goal though our priorities and perceptions of the issues may differ from time to time.
- We have identified the roles played or that could be played by the formal, the non formal and the informal sector in environmental education and this clearly demonstrates that there are many actors in this area
- There is a relationship between environmental issues and development and that environmental education occupies a key role in addressing environmental problems hence it is essential for sustainable development
- There is a need for effective planning if environmental programmes have to achieve the goals set and if their impact has to be sustained
- The delivery systems for environmental education need to be addressed if the desired change in attitudes and values towards the environment is to be achieved.

The few observations I have highlighted above call for a need for an effective networking, communication and monitoring system if we are all going to achieve the same goal. The questions that we should be asking ourselves during this session are:

Questions for discussion

- How can we set up an effective networking system that will allow for:
 - effective information dissemination on environmental issues,
 - 'multi' way communication among all parties involved e.g. planners, implementors and recipients of the programmes to allow for flow of information and establishing understanding on what is being done by the different groups,
 - continued consultation among the formal, non formal and informal sector in setting realistic targets and goals and looking into ways of avoiding unnecessary duplication of programmes. This will allow for cost effective implementation of programmes with maximum utilisation of the resources,
 - an effective monitoring, evaluation and appraisal of programmes being implemented?
- What roles should the formal, non formal and the informal sector play in the setting up of a coordinating machinery?
- What are our (formal, non formal and informal) priorities and time frame in setting up this coordinating machinery?
- Is there a need for setting up any administrative structure to advise, monitor and facilitate implementation of environmental education programmes?

These are just a few of the questions you could ask there are many more still to be asked.

Closing Address

Louis Nchindo

Chairman, Kalahari Conservation Society

Ladies and gentlemen, I have one advantage in closing this conference: since I did not participate in it and I'm not sure what you discussed, I feel free to say whatever comes to mind.

One of the things that I think I should emphasise from what I have heard this morning on the question "What step next, what do you do next?" to ensure that what you have been discussing is implemented, is your personal involvement. I think one of the things you could do is to join the Kalahari Conservation Society (KCS) and be active in it, because for several years now we have pioneered environmental education.

We were the first non-governmental organisation in Botswana to start a unit devoted to environmental education. We have supported the Wildlife Clubs, and have actually employed educationalists to spread our message. We did this because we felt that adults are set in their ways and it was important to start with their children.

I'm very encouraged and very pleased to see this conference take place, in fact I would call it a milestone in the conservation strategy of Botswana. For the first time teachers, both at primary and tertiary and secondary levels as well as government people have come together to discuss the issues and plan.

I should warn you that sometimes our Government is good at articulating various sensible policies, but over the last few years that I have been active in the economy of Botswana, I have noticed a reluctance in the implementation. They are sometimes slow in implementing their policies and I think that this particular cause, the cause of the environmental education, as well as conservation, lends itself to private initiatives. You as individuals, as organisations and as private organisations need to seize the initiative and do something about this major issue. Don't leave it to the Government! A Government Official is here today, going to Paris tomorrow, and after that I'm sure he is going somewhere else. And this is the problem, people in Government have a lot on their plate and if you leave things to them, they don't get it

done. I'm saying this with the greatest respect to our Government. But on this issue it is up to you to grab the issue and run with it.

We in the KCS have always lamented the fact that Botswana seem uninterested; it is a pity because this is a very important aspect of the life of our country and our economy. I have always believed that any organisation that purports to speak for Botswana, that purports to recommend to government policies that affect the development of Botswana should have Botswana in it—not necessarily as a majority, but Botswana should be there, because it is only Botswana with a long term commitment to this country that can make really sensible contributions. I urge you, please, join the society or form other ones; I don't mind, but be active! It would be very nice if we could see more of our scientists, the teachers, be they expatriate or not, being active in the Society. It is only in this way that the Society can become strong, so that it can effectively help in spreading this message of environmental education.

You know, it has become the norm in Botswana that conservation and environment are the prerogative of those who live in the Okavango and Kasane—if you sell petrol to tourists, you are a conservationist, if you sell vegetables to tourists in Maun, you are a conservationist. Well, I think it affects us all. We should all be conservationists.

More importantly we need thinkers; the educationalists/scientists who can look at this thing more sensibly, more scientifically. I say this because I am afraid, looking around the world at conservation, that we find science being replaced by whim. It's an emotive issue and it's so easy to run away from scientific facts and just talk emotionally to influence public opinion. I never forget a letter I got some years back from America from an old lady who wrote to me after seeing the first film against Botswana where they said we were killing a lot of animals with our cordon fences. It said, "Dear Louis Nchindo, I am writing to you from Colorado. I am an old lady. I believe in reincarnation and you should do something about these wildebeest because I might come back as a wildebeest!"

Students from Maitlamo Primary School in Lobatse examining banana plants in their school grounds.

Well, the point about this letter is that it is the gullible public that most so-called environmentalists or conservationists play upon. They prey on these little people and take their money and whether or not they are pushing the right cause or the wrong cause or are telling facts or lies, they are supported by these poor old people who are often told a load of rubbish. It is up to you who live here who are articulate, educated, and who know better to actually stand up and tell the truth, not just to our own people, but to the world!

For the last five years, Botswana has been reeling under attack from people who probably have never been here, and who are not really interested in Botswana. It is only through proper environmental education that we can teach our people so that they will be able to stand up for themselves. I would like to commend the Government on their National Conservation Strategy. It took a little while but I presume this is because it was thoroughly considered. I hope it will be implemented because it is vital; as vital for Botswana as it is vital for the rest of the world.

Ladies and gentlemen, I don't want to keep you longer, I know you are very good speakers—you are all teachers. I am not and therefore I don't wish to pretend to lecture to you. Thank you very much for inviting me—I now wish to declare the conference closed.



Annex 2

Conference workshop papers

Current experience in active environmental education at Mochudi Education Centre—using the child's experience

T Platte

Education Centre Director

The Mochudi Education Centre Environmental Education Committee gave a presentation about the Centre's environmental activities. The Committee is made up of primary school teachers from various schools in Mochudi. This serves as an advisory committee for teachers in Kgatleng District.

The Centre has had an environmental education programme since 1988.

The Environmental Education Committee has designed activities on environmental education and compiled them in a *teachers station box*.

Topics covered by the activities in the box include litter, stones, soil, water, insects, nature in relation to the five senses and animals. These topics are arranged according to the nature colours. Also in the box are workcards with problem solving questions for the learners.

Primary school children were found to be an important target group for environmental education activities. Primary school pupils as they are the future generation should be taught to conserve the environment. They are also seen as an appropriate dissemination channel to the adult population of the country.

The learners immediate environment is used to help them acquire the knowledge they need about the environment. Serious consideration is given to advance planning in preparing activities for pupils.

The Centre has set aside Wednesday mornings for pupils together with their teachers to work at the Centre on environmental education.

The teachers' advisor at the Centre would normally be there to help with the initial orientation of learners in environmental education.

The orientation mainly looks at assisting the learners to develop research skills and observa-

tion skills as well as communicative and cooperative skills.

The pupils need to reflect proficiency in comprehending instructions as the tasks prepared for them are learner centred.

Still during the orientation the pupils get their mathematical skills of direction and measurement developed.

The Centre serves thirty-two primary schools and eight secondary schools in Kgatleng since the Centre has transport to collect pupils from schools outside Mochudi.

For planning the activities, the teacher with the pupils plan their own activities, as the activities have to be planned for any particular class. Most of the planning involves identifying study spots.

The environmental committee helps to adjust the teachers plan to be most suitable but the individual programme for a school is drawn up individually. Teachers have their own long term and specific objectives.

Environmental education activities at the Centre are usually planned for a special time allocated with consideration given to other subjects of the curriculum.

The focus is mainly towards changing the learners habits and how they relate with the environment. The pupils should appreciate and learn nature. Attitudes of pupils have been noted to be slowly changing. For instance, children sometimes very quickly kill creatures if they feel threatened by the creature.

Environmental education is a two way process—teachers also learn from their pupils. That means the role of the teacher is changing. He/she is more an advisor or guider than the "manager" of the classroom.

Experiences with environmental education in pre- and in-service education in Swaziland

Irma Allen

Director In-Service Education and Training, M.O.E. Swaziland

Introduction

At international forums, since the Tbilisi Conference, teachers have been identified as a key factor in the education of people to an awareness of the environment and its problems. Cognizance also exists of the inadequacy of existing teacher training programmes for the teaching of environmental education. It was in response to that need, that the UNESCO-UNEP International Environmental Education Programme, from 1983-1985, produced some materials for pre-service and in-service teacher education as part of its environmental education series.

My experience with environmental education in various countries is that usually, the move towards environmental education begins with the development of curriculum materials for the primary and secondary levels. Unfortunately, when those materials are included in the textbooks and curriculum, teachers often have great difficulty in using them. Teacher-training programs have not generally included environmental education, and teachers lack the concepts, skills and attitudes which they are then expected to know and to teach. What is even worse, is that teachers are often poor models for environmentally appropriate behaviour. It is accepted that behaviour is an overt expression of the individual's knowledge, attitude and values, and if environmental education has been missing from the teacher's training, it is demonstrated first of all by his/her behaviour.

Teacher behaviours do have an impact on student classroom behaviours (Penick and Shymansky). In fact, it is accepted that teacher influence extends beyond the classroom. In activities aiming for changed student behaviours, it is therefore implicit that teachers be the models of the desired behaviour by action and by word. Teacher education and training can be a means of developing these desired behaviours.

In Zimbabwe and in Swaziland, the integration of environmental education began with the school programs. In Zimbabwe, environmental education at teacher training colleges was rapidly implemented. In Swaziland, the initial environmental education training came through

in-service workshops, and finally, it is working its way into the pre-service curriculum.

Pre-service environmental education

The opportunity to integrate environmental education into the curriculum of the teacher training colleges came in 1987, when the program of studies was being changed from a two year certificate program to a three year diploma program. Subject committees were appointed to draft the new syllabuses, and they agreed to integrate environmental education into the various subjects instead of having a separate course. Efforts were made in this direction, and elements of environmental topics can be found in the syllabuses.

Three years into the program, we can now assess the approach which was used, and identify strengths and weaknesses. We are now in a position to make some recommendations which we hope to use in a revised program, and which can perhaps also be of use to others, like you in Botswana, who are getting your programs off the ground.

Some recommendations are as follows:

- Time needs to be spent on systematic and holistic planning to determine the desired outcomes (in terms of knowledge, skills and attitudes) across the whole program of studies not just under individual subjects. There needs to be a clear, collective vision and understanding of the goals of the environmental education pre-service program.
- The objectives of the environmental education component in each course must be clearly spelled out and stated separately under the major course objectives. This is to ensure that the environmental component is given importance and included in the examinations.
- Teacher educators must be given intensive in-service training in environmental education in order to ensure that they are able to teach the new materials.
- Teacher educators need training in using interdisciplinary and multi-disciplinary approaches commonly used in environmen-

tal education. Only then will they be in a position to help student teachers learn to integrate math, science, language and arts concepts and skills for environmental education projects and activities.

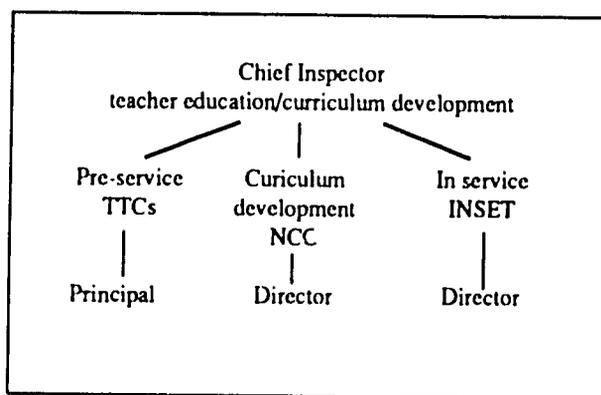
- Because of the complex and unique nature of environmental education, and the great demand it makes on teacher educators, who generally have not had environmental education themselves, consideration should be given to developing a separate environmental education course which will emphasize methodology, in addition to the integration of environmental education into the various subjects of the pre-service teacher education program of studies.
- The environmental education pre-service program needs to help teachers interact closely with the community. Therefore, specific community/school development activities and/or projects should be required of student teachers as part of their training.

In-service environmental education and training

In-Service Education and Training Unit (INSET)

Initially, the In-Service Unit at William Pitcher College was set up to train the unqualified primary school teachers. However, in the past eight years, its functions have become much broader, and they are still expanding. For nearly six years, initially as part of the Ohio University Teacher Education Project, it has been carrying out a national in-service programme for all primary school teachers. It also has the responsibility for infusion of the National Curriculum Centre (NCC) materials in the schools. The Unit works closely with the Inspectorate, Teacher Leaders, and Peace Corps volunteers in operating the four regional Teachers' Centres (TIDCs) and with Advisory Committees and Regional Education Officers planning and implementing continuous in-service activities at these Centres, thus promoting in-service on a regional basis. The Unit coordinates in-service activities at primary, secondary and teacher-training levels. INSET mounts special courses, as required. For example, in connection with the new Education Project (Educational Policy, Management, and Technology), it is now responsible for carrying out an intensive 120 hour management course for all primary and secondary school head teachers, and for the in-service training of all teachers in the use of tests for continuous assessment and the use of remediation materials. The structure of INSET which now exists is shown above.

A diagram to demonstrate the multiplier effect system which INSET uses to reach primary teachers in all schools is found later in the text.



INSET's role in environmental education

As materials integrating environmental education topics were produced, there was a need to help teachers teach these topics. Thus, in-service training for those activities was included in the existing national in-service programme for primary school teachers. (The main goal of that programme was to help teachers cope with the new curriculum materials.)

The in-service programme depends on a cadre of teachers called Local In-Service Teachers (LITS) who have been trained to carry out workshops and other in-service activities for the teachers in their own school and those of a sister school. Periodically, special presentations on environmental education topics, methods, and issues are given to them, and they, in turn, present those at school-based workshops. A constraint that was soon obvious was that the in-service lecturers themselves needed some training in environmental education. They were often forced to seek resource people (from NEEP or extension services) to help teach some of the materials. Thus, several efforts have been made to help train the in-service lecturers in environmental education.

Once a term, a special in-service activity is held, usually at one of the game reserves. These have been greatly enjoyed and have resulted in increased interest in the environment on the part of the lecturers. In addition, environmental education has become a part of the one-week Annual Education Staff Development Conference which is attended by all lecturers from the teachers colleges, inspectors, curriculum designers, heads of sections of the Ministry of Education, and Faculty of Education lecturers from the University. A special workshop on environmental education is now also being planned annually for teacher educators.

Efforts are also being made to invite teacher educators, in-service lecturers, curriculum designers and inspectors to participate actively in non-formal environmental education activities, such as the Clean and Beautiful Swaziland Campaign. By interacting closely with the

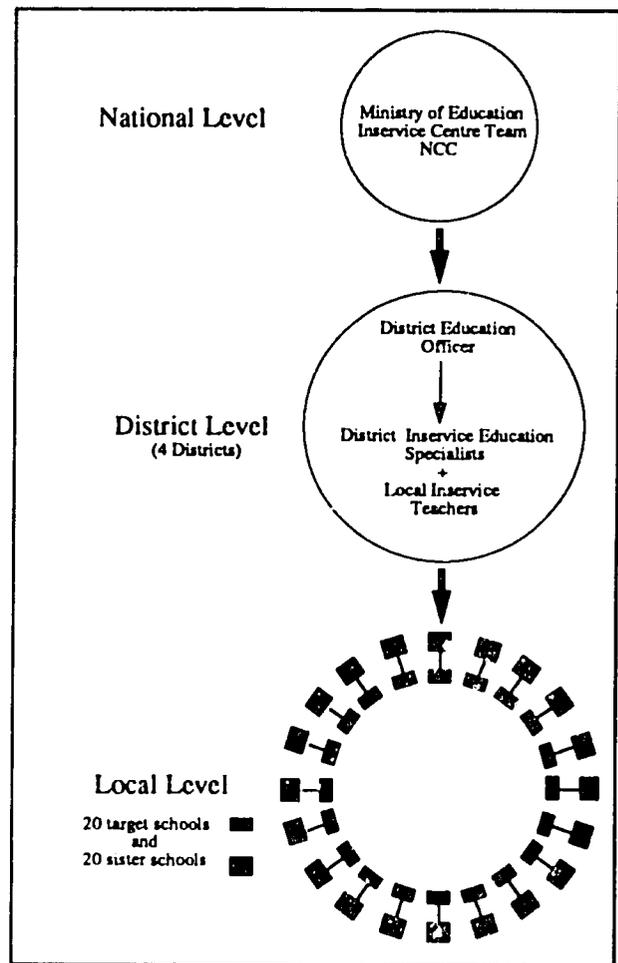
Diagram of multiplier effect which INSET uses to reach primary school teachers in all schools.

community, the educators are often motivated to do more in the formal programmes so as to effect change.

These relatively modest efforts in environmental education in pre- and in-service teacher education are beginning to show some good results. Much more, however, still needs to be done.

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Implications for implementation of environmental education in primary schools in light of experiences with MOE initiatives (in-service and pre-service)

L P Kopong

In-service Leader Teacher Education

The implementation of environmental education in schools if accepted will be calling for change of various aspects that we cannot ignore. For example it will be calling for:

- Change in the way teachers should approach the curriculum.
- Change in the way time tables should be arranged to include another aspect of the curriculum.
- Change relating to teacher's attitude.
- Change in the way teachers are prepared during their initial training.
- Change in the way decision makers, especially heads of department in the Ministry of Education, communicate regarding this aspect of the Curriculum, (Government commitment)
- Change in the way we assess children/students in order to make sure that proper learning of concepts and skills happen effectively without the examination system being an obstacle.
- Change in the way other things that I have not mentioned above.

The implications as will be mentioned later will be based on the experiences this department (Pre-services and In-service) has had with other Ministry of Education initiatives relating to effective approach to curriculum. Some of the initiatives are:

- Breakthrough to Setswana Literacy
- Botswana Teaching Competency Instruments,
- Continuous Assessment
- Guidance and Counselling
- Special Education
- Project Method
- Components of good teaching
- Self-study concept.

The implementation of the above mentioned programmes had very serious implications which unfortunately were never thought of seriously. As some educational philosophers put it "change is knock on effect". That is the first

stage of change always touches on the next one. Experiences with the above programmes has taught us that we need to consider the implications carefully before we implement would like to refer to few examples relating to some Ministry of Education initiatives

Breakthrough to Setswana literacy programme to teach the Breakthrough method. This programme started in 1983 after it was discovered that literacy in Setswana in our primary schools was poor. The programme was piloted for three years (1983-1985). The method was accepted as a policy to be used in all primary schools in Botswana in 1986. At the time this method was adopted countrywide, there was a lot of excitement. Schools were excited to see the children learning the language faster with less problems, parents were excited to see their children writing properly, speaking fluently and reading fluently before the end of their standard 1 year. Officers and other educationists were also excited to see results of the method. This change in approach touched on a number of issues that revealed the implications which were never envisaged at the time the implementation of this method was adopted. Examples of such implications were as follows:

- Intensive training of standard 1 teachers before they would be expected to implement the method.
- Full monitoring process on the implementation of the method.
- The training of trainers on the use of the method.
- Material production with proper relevance to the use of the method.
- Training in the classroom management including some modifications in classrooms infrastructure to accommodate the effective use of the method.
- Transport for those monitoring the implementation process to get to schools regularly and make sure that the teachers are given the relevant support.
- The modification of the pre-service curriculum to make sure that the colleges produce teachers with proper knowledge and skills of

- using the method.
- Thorough training of supervisors who were to help in monitoring the implementation (primary and in-services education officers).
- Government commitment through Ministry of Education departments that have direct responsibility for proper primary education foundation.

What next?

How would the enthusiasm and high motivation of the Breakthrough children be sustained through primary school education? The result for the project method. I think it is from implications such as ones regarding the implementation of a curriculum approach that Department of Teacher Education. Pre-service and in-service has learned a lot and that such experiences should be used to prepare for the implementation of other curriculum innovations that come as a result of changes in education, especially curriculum changes. Environmental education as far as we are concerned is there in our Primary Curriculum. The only snag about its teaching is that it is left to chance and as a result nobody would confidently say that our teachers are aware that they are teaching the concept. As I already indicated change is exciting because we always hope that is for the best and we all love change. But it is the handling of it that matters. In the light of the experiences expressed relating to the Ministry of Education initiatives,

although I did not mention them all, I would like to highlight the implications that we should examine carefully if environmental education has to be implemented in schools in a more formal way.

- Plans to integrate the concept into the other areas of the formal curriculum.
- Thorough training of the practitioners (teachers) through a team of trained trainers to be able to handle integration with relevant and simple materials that can be understood by an average teacher in Botswana pre-service training.
- Extensive in-service of workshops for both pre-service and in-service personnel (administrators and teachers)
- Full time responsibility assigned some teachers and officers for getting the implementation properly started with some effective monitoring and evaluation.
- Enough financial support for workshops to be conducted throughout the country and regular follow-ups to make the whole thing meaningful.
- High involvement of teachers and members of the community with less involvement of experts which always bring very complex ideas which overwhelm people.
- Creation of formal linkages between all Ministries involved to avoid duplication and confliction ideas.

Some environmental education experiences in eastern, central and southern Africa

Richard Lumbe

Community Relations Officer, Information and Public Affairs, UNEP

Introduction

The past two decades or so have seen an emergence of various environmental education programmes in the region. This paper looks at mostly the environmental education programmes conducted informally but in an organized manner. Most of the programmes are school-based, youth-oriented. A common characteristic among the more prominent and truly national ones are that they lean towards wildlife conservation, having been established primarily to counter the escalating poaching threats of the 60s, 70s and 80s. These wildlife clubs have gradually evolved over the years into broadbased environmental clubs. This transition has in some cases not been very easy. In almost all cases they were as a result of some foreign intervention, and never a truly grassroot response. Besides, most of them were for many years under patronage of conservation NGO's e.g. Wildlife Clubs of Kenya under the then African Wildlife Leadership Foundation now African Wildlife Foundation, Chongo'olo Clubs under the Wildlife Conservation Society of Zambia. The Wildlife Clubs of Uganda, the Conservation Clubs of Zambia and the Malihai Clubs of Tanzania, seen by some as the extension of the groundswell of anti-poaching sentiments among the young people, were sponsored by traditional pro-wildlife donors such as World Wide Fund for Nature, New York Zoological Society, Wildlife Conservation International and others. The conservation education tide swelled outward from Kenya in 1968 and school-based club systems now operate in Botswana, Zambia, Malawi, Tanzania, South Sudan and Uganda. The following are profiles of some of the programmes.

Zaire

The Virunga Education Programme was started in February 1987 as an integral part of the Zaire Gorilla Project initiated in 1984. The programme aims to protect the gorillas and their habitat (Virunga National Park) by raising awareness among the people surrounding the park on the ecological and economic impor-

tance of the park, its flora and fauna. During the first year a survey was carried out to ascertain the attitudes of the local people. The finding: local view is that the national park was wasted land—that the land, wood and animals should be exploited. (This is a common attitude of people surrounding parks in most countries in the region). As a result of the survey four target groups were identified: villagers around the park boundaries, primary and secondary students, administrative personnel (local government), and parks officers.

Projects were initiated under the programme to give weight to the awareness campaign by addressing specific community needs that have a bearing on the people-parks relationship.

Lack of wood for energy and construction in the area drove the people to harvest illegally from the park in response to the demands from Goma (population 100 000). Small-scale afforestation projects were established outside the park in 1987 and so far hundreds of thousands of trees have been planted.

The viability and initial modest success of the project has drawn some environmental education funding which has assisted in expanding the project area, research and extension, and training. About 25 species of trees—both indigenous and exotic are used. There have been mixed responses to the project—the community in the immediate environs of the park are less inclined to plant trees since these are in abundance across into the park. They also fear that the tree-planting projects are a ploy to extend park boundaries and push them out. Those further away see and feel the need of afforestation as an income-generating activity. The education programme centres around a children's magazine, *Kacheche* (published in French) in the mould of *Pied Crow and Action*. The first issue was published in October 1989. *Kacheche* is also used by the Rwanda Mountain Gorilla Project. Because of similarities in communities, language, habitats, fauna and flora, sharing of educational materials is without problems.

Uganda

According to Ugandan authorities, there is a dire and urgent need for a "concerted and coordinated effort" to disseminate general environmental information to the public.

This is being done presently through the efforts of some NGOs (Wildlife Clubs of Uganda, Church of Uganda), and UNICEF publishes booklets with environmental information. Government efforts are through the Forestry Department with its three mobile film vans and half-hour radio programmes.

Ugandan Government officials and NGOs say there is no lack of public enthusiasm and receptivity. A UNEP report observes three main difficulties: lack of funds; lack of coordination and systematic approach to a public awareness strategy; and a lack of training for local journalists and communication experts.

The Wildlife Clubs of Uganda can be said to be the largest environmental youth groups in the country, although very small compared to similar groups in East Africa. The clubs have lumbered along during decades of unrest and civil strife, and their existence restricted to relatively safe areas such as urban centres. They have suffered from the lack of international financial support as a result of donor-detachment from Uganda. Now that normalcy seems to be prevailing and that Uganda is well on its way to reclaiming its place in the international fraternity, the clubs may well benefit from the revival of aid, bilateral and multilateral programmes in Uganda.

Another group is the community-based Joint Energy and Environmental Project (JEEP) which in 1985 started a model village to promote self-sufficiency in food and fuelwood. JEEP has since then championed tree-planting and desertification control through public awareness campaigns.

Tanzania

The Malihai Clubs of Tanzania began as a project of the African Wildlife Foundation. The lack or scarcity of funding has restricted growth of the programme to very modest level. However, interaction at programme manager level with Wildlife Clubs of Kenya and Wildlife Clubs of Uganda, through regional workshops, has been a tremendous inspiration and encouragement to Malihai leadership. Malihai's programme is standard wildlife club fare—schoolbased, conservation-centred and made attractive by field trips, mobile film units, workshops, tree-planting and so forth. Whereas primary and secondary level of environmental education may not be that impressive. Tanzania has excelled at tertiary level in one discipline—training of wildlife managers. The College of

African Wildlife Management at Mweka has since its establishment in 1963 trained over 1 000 graduates from Africa in wildlife management. These graduates now fill key conservation positions throughout the continent.

Zambia

Non-formal conservation education in Zambia has its origins in the Wildlife Conservation Society of Zambia which started a primary school project—Chongololo Clubs—in the early 1970s. A secondary project—Conservation Clubs—was started late 1970s to complement Chongololo. Both club systems are modelled in the wildlife club mould. Of particular interest in the Zambian situation is a radio environmental club which started off as a 10-minute inset entitled Show Do in Bata Spotlight, a popular Sunday morning musical programme sponsored by the Zambia Bata Shoe Company Ltd. On 21 December 1980, conservation became the main focus of the whole programme, and it was renamed the Chongololo Club of the Air (CCOA). The 30-minute programmes are broadcast every Sunday in English and every Thursday in Chibemba.

The programmes incorporate a variety of short presentations; Mr. Chongololo (the main character) talking to animals, birds and trees, the presenters in dialogue, or interviewing people in the field, and songs illustrating aspects of nature. Programmes focus on habitats and environments, bird migration, pollution, fish conservation, animal poaching and wildlife management. Listeners are invited to write in and join the club. They receive a membership card and conservation pamphlet. The national office of the Wildlife Conservation Society of Zambia administers the club, keeping register of all members.

A survey conducted in 1990 among 1 000 members (75% response) shows average age of listeners is 17 years. Forty seven per cent of the respondents own their own radio, and 52,4 per cent listen with two to five other people. Forty eight per cent listen to the programme every week with up 59% among those who own their own radios. The general comment was an overwhelming thanks to the Society and the programme sponsor. The educational content was highly appreciated and the Society's efforts to spread conservation awareness was acknowledged as a very important and worthwhile objective. Given the importance of radio as a means of mass communications in developing countries these findings are significant.

Malawi

The Wildlife Society of Malawi runs a conservation education programme for youth. It

publishes a magazine, *Natchwenga*, five times a year. It is likely this programme is similar to those of other wildlife societies in the region.

The Outreach network

Outreach is a unique coalition of local, national and international organizations working to disseminate information on environmental and health issues. Outreach grew out of the realisation that information about the environment and its deterioration, and about personal health is not reaching many of the people who most need it. The idea evolved in 1982 when New York Zoological Society commissioned Dr James Connor, professor of science education at New York University, to write a "relevant" textbook for East African secondary schools which would address some of their most pressing conservation problems. Researching the possibilities of such a textbook revealed its impracticality. Most students drop out before they reach secondary level. The secondary science curriculum, already well established, would be difficult to change and there seemed to be no room in this curriculum for a separate focus on conservation. Thirdly, most teachers are not trained to teach conservation issues.

In search for the answer to this question, Dr Connor happened upon a special news stand edition of *Rainbow*. The editor, Ms Ng'weno had been producing this colourful children's magazine since 1976. But the issue that caught Dr Connor's interest was the annual "World Environment Day Special". With Canadian support this issue was given free to all Kenyan schools.

When asked if this could be done more regularly, Ms Ng'weno said she would need more information on environmental topics and adequate funding for free distribution.

Dr Connor agreed to supply the necessary information and CARE-Kenya agreed to support a magazine for three years with 50 000 copies sent six times each year free-of-charge to all the primary schools in Kenya. By 1984, with solid funding for the magazine and possibilities of other projects with similar needs in other countries, Mr Ivan Hattingh, Head of Development at WWF-United Kingdom and Chairman of Television Trust for the Environment (TVE), joined Dr Connor in persuading UNEP to support the development of the Outreach programme. The main objectives would be

- to encourage many developing countries to start their own magazines to supplement the elementary school curriculum,
- to provide the publishers with relevant information on environment and health topics, and
- to help them find adequate funding.

Health topics were added to the environmental ones at this time since the long range goal was to help improve school curricula and these are the two key science-related topics. If maths problems are added and the material is written within the local context to be read by the students, then science and maths, language, arts and social studies are all covered—a complete curriculum in illustrated magazine format that children love to read.

When the Outreach programme officially began in 1985, Ms Gillian Dorfman of WWF began to gather information on single topics that could be used in developing countries for print media and radio. So far over 70 packets of approximately 30 pages each have been produced. Each contains copyright-free information from a large variety of international sources, to be adopted, adapted or added to for local use. To encourage reproduction and redistribution of individual pages, the material is produced on ordinary office paper in black and white. Some material is especially written for immediate use in the classroom. Co-ordinating offices have been set up in London and Nairobi to assist in the reproduction and distribution of the Outreach Infopacs.

The first magazine was printed in Kenya in 1983 as a supplement to *Rainbow*, and then became independent a year later as *Pied Crow*. It is still produced and funded by CARE-Kenya with the co-operation of the Ministries of Education and Environment. Each issue of *Pied Crow* is 16 pages long, and consists of lively articles, cartoons and illustrations by local artists, and activities which teachers can use in or out of the classroom. Two hundred thousand copies of each issue are published.

Over the years *Pied Crow* has covered a myriad of issues including natural resources; population; health; practical skills; agriculture and employment. Some issues of the magazine have been used in national education efforts, citing, for example the importance of childhood immunization as part of the Kenya Expanded Programme for Immunization (KEPI). One million copies of a special issue on AIDS were produced to help in a national AIDS awareness campaign. Many copies of *Pied Crow* have been sent to schools in Uganda and Tanzania issues of *Pied Crow* have been translated and distributed as part of a sanitation education campaign.

Inspired by the success of the East African project, a similar children's magazine was started in Indonesia in 1984 by the Ministry of the Environment and the Green Movement with additional funding from CARE. In 1985, a children's magazine started in Thailand with funding from USAID, CARE and the Ministry of Education. In Botswana, Zambia and Zimbabwe,

Action Magazine began with funding from the Carnegie Foundation, Norway and Sweden. Outreach assisted children's magazines are now being produced in Africa in Kenya, Botswana, Zimbabwe, Zambia, Nigeria and Cameroon, and in Asia in Bangladesh, India, Malaysia, Pakistan and Thailand. Soon children's magazines will be produced in the Sahel and the Phillipines. In Latin America, there are prospects for children's magazines in Argentina, Belize, Bolivia, Costa Rica, Ecuador, Guatamala, Mexico and Peru. UNEP is currently proposing a children's magazine which is targeted to reach all the Caribbean within eight years. Each magazine is done for a country or region by local writers and artists focusing on local health and environmental problems. Magazines are currently being published in eight languages.

The Outreach audience has now broadened to include newspaper, offices and radio stations, schools and teacher training institutes, extension workers and community developers. In almost every country of the developing world the Ministries of Education have three important needs:

- curriculum development,

- materials development and
- teacher training.

Rather than try to find the huge sums of money usually considered necessary for such undertakings, Outreach attempts to be very cost effective in achieving these ends by means of the children's magazines. Most of the magazines have been targeted at primary classes where the science curriculum is more flexible, and have been a very welcome addition in elementary classrooms where any kind of teaching material is scarce. To make an impact on the curriculum, the Ministry of Education in each country is contacted and the syllabus of the schools is studied for topics on health and the environment that could be augmented by supplementary information and activities. The Ministry is also asked to aid, if possible, in the distribution of the free magazines to the schools and to have inspectors ask questions about the magazine's use when they make their regular inspections.

Experiences with environmental education in Zambia

Mr Sichilongo

While discussing fundraising for conservation education, a newspaper column read, "unlike other conservation activities, environmental education has no visible end product" The same column later asked, "will the children and youth of today not simply grow into the same structures causing massive destruction to natural resources, without regard to long term implications?" In an attempt to respond to the above statement and question, the same column said, "the basis for any education is information and awareness. What the informed individual does with the knowledge is something that cannot be dictated. It can be encouraged," continued the weekly conservation column, "the more children are encouraged to appreciate nature, the more inclined they become to respect it."

Environmental education will not save forests and rhinos and water catchment areas. It will create impressions, highlight the threats and promote the advantages of conservation. The approach ought to take into account the prevailing needs and priorities, thereby seeking to identify specific areas of action, in the best possible manner. Community based projects addressing a particular problem, suggesting alternatives and turning out sustainable benefits within a relatively short period of time, are one form of environmental education.

The World Wide Fund for Nature (WWF), is currently supporting a programme known as the Zambian Environmental Education Programme (ZEEP). The long term aims of ZEEP are to promote environmental education across society, as recommended in the National Conservation Strategy. Four ministries (Natural resources, Tourism, Higher Education and General Education) are involved. ZEEP will be involved in setting up environmental education centres, organising environmental teacher training, distribution of educational materials and dissemination of environmental information, in collaboration with existing programmes.

The Chongololo and Conservation Clubs movement run by the Wildlife Conservation Society of Zambia, is one such programme. It is crucial for the survival of the earth that present and future generations adopt more environment

friendly behaviour. This ultimately is the goal of environmental education.

This paper dwells mainly on this programme, promoting environmental awareness through providing educational materials and experiences. The paper outlines the current status and closes with some thought for the future.

Summary

Chongololo and Conservation Clubs of Zambia is an environmental education programme for youths, under the Wildlife Conservation Society of Zambia. It consists of a network of clubs in primary schools called Chongololo, which means millipede, and secondary school clubs referred to as Conservation Clubs. The movement currently has about 1000 clubs all over Zambia. A teacher with interest in the environment facilitates a club within a school. Each school has an average of 30 members between the ages of 10 and 20 (ie for both the Chongololo and the Conservation Clubs).

The movement is based on two environmental science publications produced by the Wildlife Conservation Society of Zambia, namely Chongololo Magazine for Chongololo Clubs and Chipembele Magazine for Conservation Clubs. Even though the movement was started by a Wildlife Society, the approach is a broad one with wildlife providing the initial focal point. The presence or absence of wildlife may be used as a measure of how much alteration has been caused to the environment by human activities. Another way in which wildlife provides a focal point to the CCCZ movement is that during the rainy season, there are hundreds and hundreds of millipedes in the environment. The movement is named after this small animal to demonstrate that it is not only big animals in national parks which matter, but small ones as well like millipedes and chameleons which are all around us. The objective is to build a foundation of young people who are aware of nature's interrelationships, how all this takes place in natural surroundings and how these relationships are valuable to us. Observation of nature is encouraged through out.

To ensure as broad based an approach as

possible, we co-operate with relevant government departments and organisations. For instance, all educational materials receive approval from the Curriculum Development Centre in the Education Ministry. We have had dealings with the Forestry Department, National Parks and Wildlife Service, Agricultural Department, Natural Resources Department, Food and Agricultural Organisation.

Chongololo magazine is designed for the last three upper grades of primary school while Chipembele is targeted at the first two junior secondary school grades. These magazines are distributed free to schools under the auspices of the Inspectorate in the Ministry of General Education, Youth and Sport. Both Chongololo and Chipembele Magazines are meant for the club member. Teachers receive a more detailed guide and a newsletter. The newsletter is intended to enhance communication with the teacher.

Further to the above, a weekly conservation radio programme is broadcast in English and one local language. The Chongololo Club of the Air (CCOA) radio programme is based on material from the Chongololo Magazine. The CCOA therefore, serves as a popular version of the Chongololo Magazine with the main character being a Mr. Chongololo talking to and about nature.

Branches of the Wildlife Conservation Society have Education Officers who help maintain contact with the schools. Many Club Leaders' Associations or Teachers' Action Groups were formed in almost all the major centres during the good years, when a field education unit went around holding training courses for teachers all over the country at District and Regional levels. Four still survive today.

Chongololo magazine

In the mid 1970's Chongololo Magazine was started as an insert in the Wildlife Conservation Society of Zambia's official journal 'Black Lechwe'. This led to the formation of the first Chongololo Clubs in schools. With this development, the Chongololo Magazine started to be produced as a separate publication to service the newly formed clubs. Clubs were formed with the consent of the Education Ministry.

From the early inserts in the Society's journal, a three year series was produced, designed according to the seasons of the year. This magazine is targeted at the last three grades in upper primary school. (Grades 5,6 and 7). The eight page magazine complete with what to look out for, how and when, how to identify natural characteristics, also include puzzles, things to colour and word games. The pages are full of fun

and simple facts about the changing seasons with nothing that needed constant updating. Two issues per school term completed a revolving set of eighteen magazines after three years. In this way, each magazine reappears in the same format but reaches a completely different set of members. The advantage is that reproduction is simpler, costs are kept low, and the undertaking is sustained to supply extra materials to schools all over Zambia.

Chipembele magazine

This magazine is a development from the Chongololo Magazine, aimed at the first two grades in junior secondary school (Grades 8 and 9). It is designed in conformity with the junior secondary school environmental science syllabus. It is also produced in the same simple format as Chongololo Magazine but with a shorter twelve issue cycle. Each issue is dedicated to one particular aspect of forest, wildlife and wetland topics. 25 copies of each issue of the magazine and 5 copies of a Teachers' Guide are sent to each registered school Conservation Club.

Teachers' guides

Each issue of both Chongololo and Chipembele magazines is accompanied by a teachers' guide. The guide has more detailed information, expanding on the topics dealt with in the magazine, and suggesting ways of tackling them.

Index

An index and special file covers have been compiled for the Chongololo magazine. The file is meant to keep the magazines such that after the cycle has been completed, a useful reference document about the environment and Zambia, emerges.

A similar Index is being developed for the ongoing Chipembele magazine.

Newsletters

Reproducing magazines in the way outlined above has limitations, particularly to the teacher who receives magazines whose contents are already known. As a way of avoiding this, duplicated newsletters are compiled and distributed with the magazines. These newsletters carry club activity reports, letters, competitions, news and extra ideas for club projects. Interesting reports are expanded for the benefit of the originators as well as other clubs. The newsletters provide a more up to date means of communication with the clubleaders. Clubs are encouraged to maintain contact with other clubs and relevant conservation oriented organisations including Government Departments.

Teacher training colleges

As a result of a schools' essay competition by the Zambian Ornithological Society to promote the image of owls, school children were asked to submit drawings and stories they know about owls. These stories have been edited and compiled into a school reader which has been circulated to a cross-section of schools and colleges for trial and evaluation.

There are Chongololo and Conservation Clubs in some teacher training colleges which are already receiving educational materials for the Chongololo programme. On the assumption that teachers are more likely to use materials which they have been exposed to in training, class sets of any educational materials which are developed will be sent to colleges for in-service training purposes

Other materials

As part of the education programme, extra materials are being developed as and when feasible. Some are a result of competitions, others are to commemorate particular events and still others are to promote a particular aspects of the environment such as trees, or the illegal exploitation of wildlife.

When these are produced, they are distributed together with Chongololo Magazines. Such materials include posters, environmental games and project ideas.

Prospects for the future

The present situation is characterised by low levels of funding, increased printing and other running costs against the need to provide materials generally in short supply. This has led to a reduced frequency in producing materials and sometimes to a standstill while funds are being searched for. However, the revolving nature of the main publications make reprinting costs minimal. The sustainability of the existing

programme for nearly twenty years is probably the biggest achievement.

The question of sustainability was responsible for the discontinuation of a field education programme which visited district and provincial centres holding training programmes. Not only did such an undertaking provide a crucial morale booster, it also enhanced skills in communicating conservation among teachers. However, it took three years to cover the whole country, that is, three years before a centre could be visited for a second time. So given the limited financial resource, the field education programme was stopped. In anticipation of this, Teachers' Action Groups were formed in every centre where a training course was held. To date, all but four of the Teachers' Action Groups have folded up.

In the face of the above developments, an important consideration for the future is to investigate possibilities of locating support to create more self sufficient Environmental Teachers' Action Groups. Such groups are very instrumental in organising activities to keep the interest of teachers in environmental conservation activities. Another important activity that could be enhanced by a well supported action group is to maintain contact with natural resource based organisations and government departments. This group is best organised and composed within the existing structure of the Education ministry. After all, Chongololo and Conservation Clubs are officially recognised as extra curricula activities. And, since its inception in 1978, the Chongololo and Conservation Clubs movement, in conjunction with the Education ministry, has produced a mass of citizens with an awareness of conservation.

As is envisaged in the long term aims of the Zambian Environmental Education Programme, continuation of this work is of extreme importance to the future of the country.

An overview of the status of environmental education in current curricula and examinations in secondary education

S Makgothi, F Stoneham, P Richard and C Matlhare
Ministry of Education

The aim of this paper is to show that while there is no independent programme on environmental education in the secondary school curriculum, there is a fair amount of material on environmental issues integrated into the content of the various subject areas.

Current curriculum intentions on environmental education are imbued in the aims of the Nine Year Basic Education Programme which states that students should “show an awareness of the forces and events that created the environment around them, in Africa and the world,” and “describe and appreciate Botswana’s environment, society and development and their inter-relationships.”

This presentation will therefore outline areas of content in various subjects both at junior and senior secondary school level which cover material on the environment.

Social sciences

Junior school—Social Studies

Social Studies has elements of environmental education in its syllabus. One of the subject aims in Social Studies is that when pupils finish the nine years of basic education they should “describe and appreciate Botswana’s environment, society and development and their inter-relationships.” This aim is further broken into learning themes from standard 1 to standard 9.

The concept of the “environment” starts with the immediate “home” in standard 1 and goes on to the “world at large” in standard 9. The spiralling nature of the syllabus means that the concept recurs throughout the standards. Some instructional objectives range from “describe ways in which plants are protected against human abuse for example, veld-fires, theft and deforestation” at lower standards, to “identify the major environmental problems facing Botswana” or “describe strategies which are being used to improve or correct environmental problems in Botswana for example, laws, regulations and programmes at higher standards.

Senior school—History and Geography

While the O’ Level syllabus remains controlled from outside the country, it has seen a lot of

changes over the years. The syllabus has moved from learning about Bismark in the 1970’s to learning the history of southern Africa in the current syllabus. The same is true of Geography. The present syllabus moved from one that taught Industrial Development in the USA and Europe, etc., to one that shows concern for issues around the pupil’s own environment. Both subjects are still controlled from outside so it is difficult to influence the content in the subject. There are some topics that touch on aspects of the environment, and these include:

- The development of land for agriculture—clearing and preparation, methods of irrigation, problems associated with developing land for agriculture, soil erosion and conservation.
- The interpretation of topographical maps
- Land forms
- Weathering
- Weather study
- Climates and natural vegetation
- Agricultural systems
- Mining
- Forests and forestry
- Fishing
- Power production
- Processing and manufacturing industries
- Tourism

Sciences

Junior school—Integrated Science

An attempt has been made at the junior secondary level to implement the integrated way of teaching Science. This approach has made it possible to bring different scientific disciplines together with the aim of improving the learner’s basic understanding of scientific phenomena and the environment.

The following is a list of topics in the Integrated Science syllabus which are seen to be part of the environmental education content.

- Reproduction, Plant Reproduction, Human Reproduction, Population Education
- Water—sources of water, water storage and conservation, water purification

- Gases of the Atmosphere
- Energy, Forms of Energy, Sources of Energy, Energy Conservation, Alternate Forms of Energy
- Nutrition and Diseases
- Natural Resources, The Earth's Resources, Fossil Fuels, and Use of Natural Resources
- Environmental Awareness, Interdependence of Living Things, Pollution, conservation of Natural Resources, Vegetation, Wild Animals, Soil and Recycling of Materials.

Sciences—Senior school

Biological Sciences

- Organisation and Maintenance of the Individual
- Diversity of Organisms
- Relationships of organisms with each other and with the environment (including the effects of man on the ecosystem)
- Development of organisms and the continuity of life

Physical Sciences

- Pollution, pollutants and their effects
- Fuels
- The Atmosphere
- Major sources of energy
- Radioactivity and nuclear waste disposal

Agriculture—Junior School

Agriculture—The Agriculture syllabus in the junior school also explores issues on the environment. Environmental problems are addressed by the following objectives:

- to identify problems in Agriculture, investigate the cause or causes of the problems as well as to come up with solutions for them”
- to understand the value of soil, how it is formed, methods of improving and conserving it, and its role in agriculture.

The Agriculture syllabus, therefore, does address environmental conservation although it cannot do so fully because of the time element. Students learn about:

- Soil fertility
- Importance of soil
- Erosion and its control
- Crop Rotation
- Communal and ranching systems of rearing cattle

Agriculture—Senior School

The Senior school covers the following areas on environment education:

- General Agriculture—Environmental Influences Importance of Agriculture General Principals of Land Use Forestry Natural Agricultural Programmes
- Crop Husbandry
- Livestock Husbandry
- Farm Structures and Machinery
- Agricultural Economics

Design and Technology and Home Economics

While it was not possible to make an in depth analysis of the content of these two subjects for the purpose of identifying content relating to environmental issues, we are aware that they do contain such content.

Design and Technology stresses problem solving and the use of appropriate materials in design.

Home Economics with its emphasis on the promotion of good nutrition and health in general also contains elements that link it with environmental issues.

English Language—Junior School

While the subject does not contain any aims and objectives directly linked to fostering environmental education, one of the aims is that students should “enjoy reading a range of literature, not only fiction but also general interest works and material based on other subjects of the curriculum.”

It is in this regard that some environmental issues are explored. Isolated topics relating to the environment are found in Reading Comprehension and in Supplementary Readers. Reading Comprehension passages range over topics such as animals, fire, the Sea, water, oil, drilling for water in Botswana, generating electricity, wildlife conservation and soil erosion.

In addition, there are Supplementary Readers on the the following:

- Trees
- Water
- Germs
- Bilharzia
- Wild Life
- Soil Conservation

English language—Senior school

Reading comprehension passages based on environmental issues do occur in the course books used in the Senior School. These include subjects such as food and nutrition, fishing, rubbish disposal, insects and growing cotton to mention but a few.

The status of environmental education in the examinations

Since Environmental Education is not treated as a separate subject in our junior and senior secondary curriculum, there is no special provision for it in the examinations.

The examinations are designed to test appropriate knowledge and skills outlined in the different subject syllabuses. If the specific objectives in a particular syllabus relate to environ-

mental education, then questions testing those objectives will be included in the examination.

Conclusion

In conclusion, we contend that our curriculum does cover an extensive amount of environmental education. What is lacking is an emphasis on special issues such as application of knowledge, practical work and developing a positive environmental awareness.

Starting Points—a look at background knowledge approaches and attitudes towards environmental issues amongst secondary school teachers in Botswana

D Marsland

Field education officer (Science), Maun

Introduction

It is intended that this paper should act as an introduction to further discussion of environmental education in the secondary curriculum of Botswana. As such it is not to be treated as an indicator of the 'way forward' in this arena. Primarily its intention is to identify the current situation regarding teacher background, attitudes, feelings and approaches towards environmental issues and education. Before environmental education can find direction it must first know where its 'starting points' are.

Procedure

In an attempt to ascertain these current starting points a limited questionnaire based survey has been made of teachers in Botswana's Secondary Schools. All replies were from schools in the Junior Secondary sector. Questionnaires were sent out to approximately 150 teachers in 30 schools. Schools gazetted were nationwide and represent a fair mix of rural, semi-rural and urban schools. Each set of questionnaires was accompanied by a letter to the headmaster explaining the purpose of the exercise which was to help in the planning of environmental education. A stamped addressed envelope was also provided for the return of the completed items. The headmaster was requested to hand out the questionnaires to different members of his teaching staff. It was suggested that a headmaster hand out copies to:

- a Science teacher
- a Social Studies teacher
- an Agriculture teacher
- two other remaining members of staff from these or other subjects.

Headmasters were also asked to give preference to completion by Botswana teachers as these represent the most permanent component of the country's teaching force.

Attached to each questionnaire was an accompanying letter explaining the purpose of the exercise to the teacher and the philosophy behind it. Four aims were given, namely to ascertain:

- what previous knowledge and experience teachers have of environmental issues and education,
- which issues are already taught (in some form) and where and how they are taught,
- what priority teachers place on environmental education,
- what direction environmental education in Botswana should take.

Questionnaire design

The questionnaire was divided into four main parts:

- *General information on the school*, the teacher's main and secondary teaching subject, teacher nationality, qualification, training institution and experience. No request was made for teachers to identify themselves to avoid the feeling that this was a 'test situation'.
- *Background on the environment*. This section was intended to investigate teacher background knowledge of environmental issues. Questions involved matching given words with given statements (for example, decreased genetic diversity/extinction or increasing levels of carbon dioxide/global warming.) A second set of questions gave statements on environmental issues and requested true/false/unsure replies, for example, the Earth's resources are finite?
- *Which environmental topics are covered*. Seven major environmental issues were included in this section. Teachers were asked to tick a box according to whether these were taught by them in the course of their work.
- *What is done in environmental education*. Teachers were asked whether they considered the present curriculum contained enough 'environmental content'. If their answer was no then they were requested to make suggestions as to where and how content could be enhanced. They were also asked what they considered the best approach to this topic is in terms of effective teaching, for example, teacher presentation, in the environment. Teachers were asked whether they ever taught outside their classroom, whether their school had any special facilities for such

teaching. They were also asked to give an opinion on whether integration of environmental issues into the present curriculum or teaching as a separate subject was preferable.

Results

General Information

A total of 44 completed questionnaires were returned from 21 different schools. Of those returned the breakdown of teachers by first and second teaching subject was:

Subject	1st teaching subject	2nd teaching subject
Agriculture	4	-
English	2	1
Design Technology	1	1
Mathematics	6	6
Science	21	7
Religious Education	2	-
Setswana	1	2
Social Studies	7	6
Total 2nd subject		17

Teaching experience ranged from three months to fifteen years with mean experience of three years four months. Thirty-two of the teachers (72,7%) were Botswana nationals. Four of these teachers were Cambridge leavers, the rest had their training within Botswana. Out of the total trained teachers nineteen had diplomas and twenty-one had degrees (including two Masters).

Background on the Environment

There was a large variation in the background knowledge of teachers on environmental issues. This variation showed no relationship to level of teacher training qualification. Science,

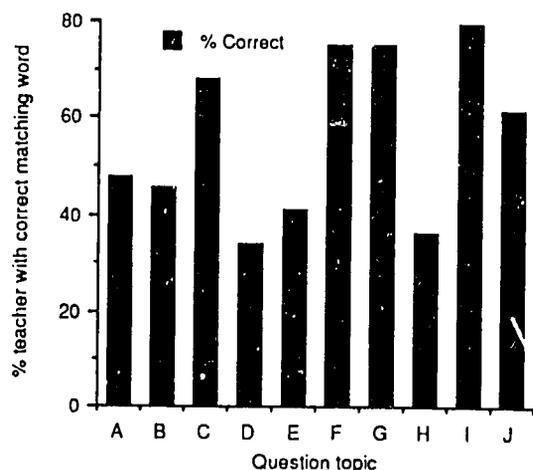


Figure 1
Teacher matching word response questions (A-J)

agriculture and social studies teachers showed the best command of these issues. The environmental issues selected for the questionnaire were obtained from two sources; one with a global perspective and the other with a bias toward Botswana. Both were non-technical and are typical of reading material within the capabilities of all the sample. In the word matching questions correct scores obtained are shown as percentages in Fig 1.

Table 2: Topics tested by word-matching exercise.

- A. Extinction and genetic diversity
- B. Irrigation and salination
- C. Acid rain and sulphur dioxide pollution
- D. Global warming and carbon dioxide
- E. Harmful effects of ozone depletion
- F. Land degradation and desertification
- G. Population and carrying capacity
- H. Knowledge of the concept of Gaia
- I. Alternative energy resources
- J. Biological cycles (carbon-cycle cited)

When incorrect/misplaced answers are analyzed it is apparent that a great deal of confusion exists between issues. This confusion is often compounded by popular reporting (and may therefore indicate its source). For example answers for global warming, ozone depletion and acid rain were often mismatched. Six teachers obtained the correct responses to all the matching exercises. With an average correct response of 56,4% there are significant gaps in teachers' knowledge of environmental issues.

The true, false, unsure, section of the questionnaire (Question topics shown in Table 3) showed up some further misconceptions and deficiencies in teacher knowledge. These responses are shown in Fig 2. Both incorrect answers and unsure are given.

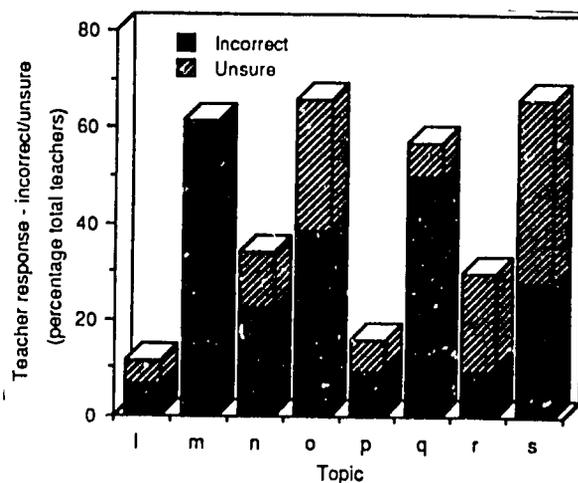


Figure 2
Incorrect/unsure responses for questions l-s
A National Planning Conference

Table 3: Topics tested in true/false/unsure response questions (l-s)

- 1. World population growth
- m. Possibility of sustainable development
- n. The finite nature of resources
- o. Concentration of toxins in food-chains
- p. Family size and environmental impact
- q. Developed countries as main culprits of environmental damage.
- r. Habitat destruction as an agent of extinction
- s. Biological complexity and ecological stability

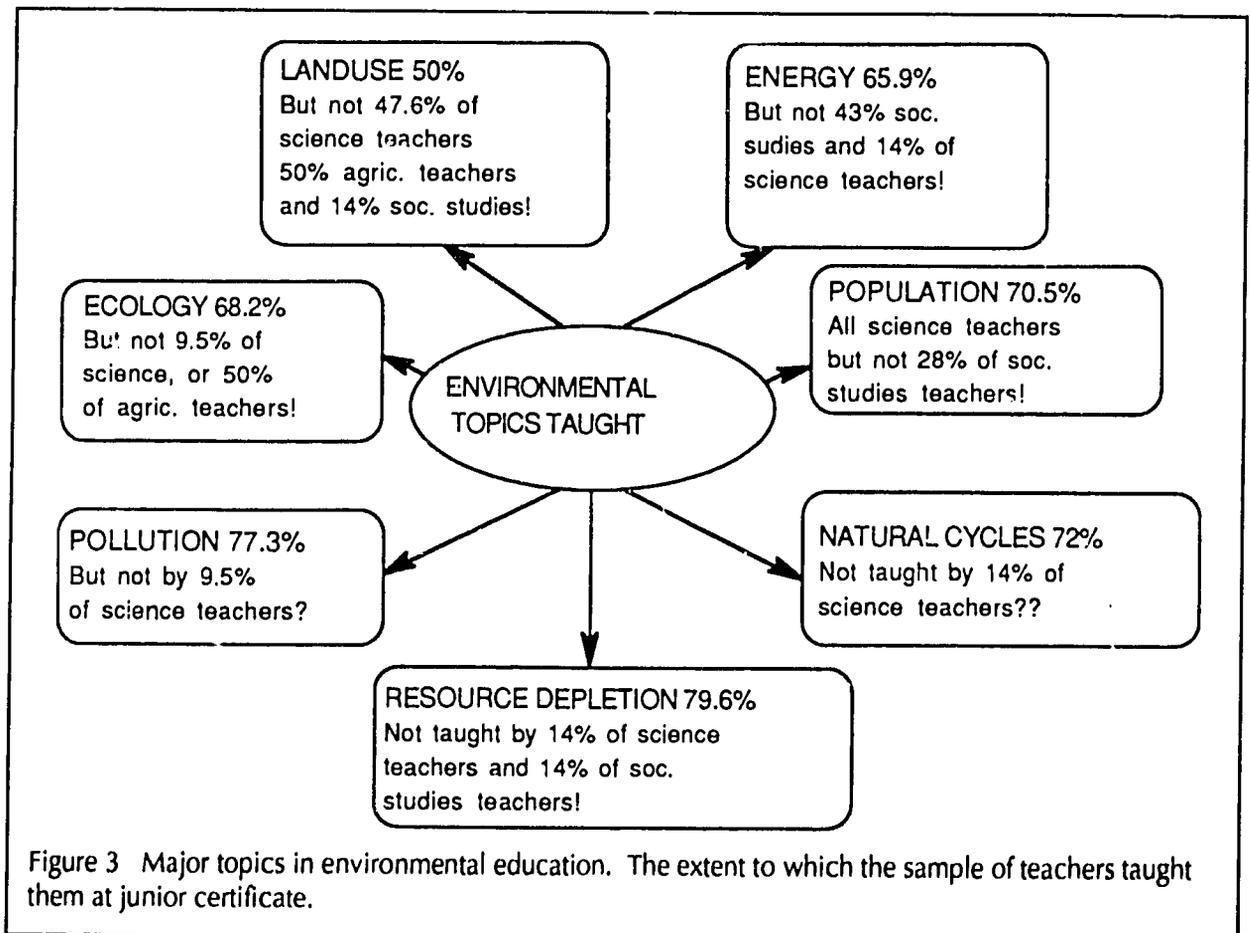
56,8% felt that modern science was capable of constructing accurate models as to how the environment works.

Which Environmental Topics are Covered

Although those developing the curriculum may have clear ideas as to those topics to be/ being covered by the teachers and their students this may not be so obvious as far as the teachers themselves are concerned. From the results it appears that many teachers (Fig 3) do not recognize topics as being of 'environmental significance' or they are not teaching the topic at all. Agriculture, Science and Social Studies were the subjects mainly involved in teaching these topics of which seven were specified. The percentage given after the topic title represents the percentage of the sample of teachers who identi-

fied that they in fact taught aspects of the topic in question (examples were given in the questionnaire to help teachers with identification for example, population: growth, control, contraception or natural cycles such as, carbon, nitrogen and water). The teachers mentioned below these represent those that did not identify with the topic mentioned despite some content on their syllabi.

One would expect that recognition of these topics as environmental issues would be required by the teacher to enable the delivery of the requisite information and, more importantly, attitudes to the students. Without clarity in the teacher's mind as to which environmental topics are included within the boundaries of his/her subject there is little hope for clarity in the mind of the student. Those teachers who recognised environmental content within their coursework were mainly in agriculture, science and social studies. However a few teachers from other areas of the curriculum also admitted making contributions namely: population statistics in mathematics, moral issues behind pollution and landuse in Religious Education. Those extra-curricular activities cited as having 'environmental content' were school trips, wildlife clubs, science clubs and guidance and counselling sessions.



What is done in environmental education?

As to the environmental content of the present J.C. curriculum no teacher felt it was overloaded. 45,5% felt that the present content was 'enough', 54,5% that it was insufficient. Areas where content and activities could be extended were suggested by about one third of the teachers. Use of the environment as a teaching aid, use of local environmental statistics, emphasis on personal contributions to preserving the environment were specifically mentioned. The possibility of using environmental issues as discussion points and listening comprehension in language teaching were also suggested. Concern about the lack of practical environmental work in the present science syllabus and the cultural appropriateness of some of the materials used was also expressed. Most teachers felt that a practical approach to topics with some teaching in the environment being preferable to teacher presentation. However use of the environment as a teaching resource was only made by 52,3%* of the teachers, despite their obvious knowledge in its use as a vehicle in improving environmental awareness. (*100% of agriculture teachers, 47,6% of science teachers and 42,9% of social studies teachers.). 23 teachers made suggestions (given below) on how the environment could be used.

Table 4: Teacher suggestions as to how to use the environment to promote environmental awareness.

Constructing ponds/environmental areas
Ecology fieldwork
Collecting and classifying objects/organisms
Tree planting
Map making
Scale drawing
Estimating and measuring
Soil studies
Soil erosion/overgrazing experiments
Collecting materials for making dyes and paints
Descriptive writing and poetry
Art sessions (sketching and painting)
Recycling projects
Roleplaying/acting in the environment
Collecting historical evidence

Teachers also expressed concern over the brevity which some issues were treated. Population control/contraception, atmospheric pollution and resource management rather than just a preservation approach to conservation, the relationship between environmental issues and politics and the critical debate of these issues were other topics alluded to.

The sample of teachers were equally divided as to whether environmental topics should be integrated into the present curriculum or taught as a separate subject within the school.

25,5% of teachers considered their school had special facilities for teaching environmental content. (In particular weather stations and ponds). Only 4 teachers mentioned the use of the environment outside the school grounds as an important teaching resource. Some schools had facilities which were used by some teachers but not others (within the same subject!).

The implications of this survey

Rather than attempt to reach conclusions from this limited survey it would be more appropriate to use it to highlight points for further discussion and possible research. The following points can be distilled from the above results.

Teacher knowledge of basic environmental issues falls short of what is required to teach these issues. This lack of knowledge will have to be remedied. This should involve both pre-service and inservice implementations.

Teachers either do not recognise parts of their syllabus as being significant environmental content or omit these sections. The application of appropriate techniques to instil information and change student attitudes has, as a prerequisite, this recognition by the teacher.

Teachers outside agriculture, science and social studies rarely use the environment as a teaching resource despite the fact that they recognize its value. Attitudes towards learning and the 'correct learning environment' appear harder to change than teacher knowledge of its use. Even where teachers are required, as a component of their course, to use the environment they often fail to do so.

Although most teachers feel the need for some extension of environmental education this is not a 'strong feeling' and can only be done by reduction of other content in the curriculum.

The case of integration versus separate subject is not a clear issue in teachers' minds.

Schools do not all have environmental areas. Even where these exist they are often not used in teaching. There appears to be a reluctance amongst teachers to utilize the environment outside the school fence as a resource.

Acknowledgements

Many thanks to all the teachers who answered the questionnaire and those headmasters who arranged their prompt dispatch to the author.

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Environmental education in teacher education for secondary schools now and in the future

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Introduction

According to the 'International Strategy for Environmental Education for 1990-1999 of UNEP/UNESCO' the training of teachers is a key factor in the development of environmental education:

"The application of new environmental education programmes and proper use of teaching materials depends on suitable-trained personnel, as regards both the content and the methods specific to this form of education"

With teachers well-trained in environmental education we can achieve an enormous multiplier effect in spreading the impact of environmental education at the national level thereby increasing the cost effectiveness of the efforts made to develop environmental education.

In the National Conservation Strategy (NCS) the Government commits itself firmly to the principle of 'sustainable development' and has formulated several strategies to achieve this. One of the strategy measures formulated is to increase public awareness through education. The introduction of environmental education (unfortunately sometimes called conservation education in the NCS report) into both school and teacher training college curricula will receive general support under the Strategy.

The NCS stresses the need for the objectives of the Ministry of Education, concerning environmental education, to be more clearly defined and that consistent with this the spectrum of teaching methods used should be significantly broadened.

It is clear that the principles of sustainable development and natural resource conservation will form the basis for environmental education in Botswana.

Goals

The following goals, developed in the early '80s and subsequently used as a guide for curriculum development teacher training, incorporate these principles:

Overall goal—"to aid citizens in becoming environmentally knowledgeable, and above all, skilled and dedicated citizens who are willing to work individually and collectively toward

achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment"

Further detailed goals are worked out from this basis on the following levels:

Goal level 1: The ecological foundation level

Goal level 2: The conceptual awareness level—issues and values

Goal level 3: The investigation and evaluation level

Goal level 4: The action skills level—training and application

A special task force of environmental educators from all parts of the world were brought together by UNEP to make a list of key concepts that should be dealt with in environmental education, which links nicely to the above mentioned goals.

Key concepts

- Levels of being
- Cycles
- Complex systems
- Population growth and carrying capacity
- Ecologically sustainable development
- Socially sustainable development
- Knowledge and uncertainty
- Sacredness

These goals and key concepts can form a useful basis for curriculum development and teacher training in Botswana.

Current and planned environmental education activities in teacher education for secondary schools in Botswana

Molepolole College of Education

Environmental education elements are incorporated in curricula of the following subjects:

Social Studies—In the unit "Man and the Environment", students are assisted to critically examine the management of our environment and ecological problems such as drought, desertification and various methods of combating these are discussed. The suggested ideas are practiced during teaching practice.

Science—Sections of ecology, wildlife conser-

vation and pollution are incorporated in the syllabus. Due to constraints of time, these are not gone into in great detail, but some practical aspects of ecology are covered.

Students doing neither of these subjects will cover very little on environmental issues unless they are a member of the wildlife club.

Next to this there is a wildlife club and a MCE Environment Committee.

Faculty of Education of the University of Botswana

Department of Languages and Social Science—Environmental elements are incorporated in content courses of the Social Science programme.

Department of Mathematics and Science Education—Environmental elements are incorporated in content courses of the Science Education programme.

The department has developed a one semester environmental education course based on the UNEP module for Science teachers in which the practice in for environmental education relevant teaching methods is a major activity.

Recently research has been done on "Knowledge and beliefs/opinions of students concerning environmental issues" in secondary education(form 3 students), Molepolole College of Education(year 1 and 3) and PESC. Results will be published at the end of this year and are expected to assist in the development of environmental education in Botswana.

Very soon a major four year Environmental Education Project will start in the Faculty of Education of UB funded by SIDA.

The aim of this project is to assist in the introduction of an effective environmental education programme into formal education in Botswana, through developments in teacher training.

The environmental education component of the Natural Resources Management Project also wants to pay attention to development of environmental education in teacher training as formulated in its project proposal. Coordination is important here.

Others (technical studies and agriculture teacher training to be mentioned under Tertiary Education).

Strategies for the training of teachers in environmental education

The following is based on a discussion guide for UNESCO Training Seminars on Environmental Education which in my opinion contains very useful information for developments in environmental education in teacher education in Botswana. Where necessary I adapted it to the Botswana situation.

An international review of the status of environmental education has revealed important deficiencies in teacher training programmes (pre-service and in-service). This seems to be limited quite often to adding some content here and there.

Few if any teacher training programmes adequately prepare teachers to effectively achieve the goals of environmental education in their classrooms. Botswana doesn't make an exception in this (yet) in my opinion if we look at what is being done at the moment. Of course this is not strange, because it has not adopted these goals as such yet.

The goal of any teacher education effort or programme in environmental education should be to develop environmental education competencies.

These competencies take the form of knowledge, behaviour and skills which are necessary to effectively incorporate the environmental dimensions (based on accepted goals) in educational programmes.

The need for teacher training in environmental education:

- Is emphasized already in the introduction and was adequately summarized in recommendations of the Tbilisi Conference on environmental education already in 1977.

- However there are many constraints many educational. policy makers, planners and teacher educators are neither aware of the developments/activities in environmental education (e.g. by UNESCO, WWF, IUCN) nor of the need for teacher training in environmental education. This conference hopefully caters to some extent for these constraints but will need follow up.

Before we say something about required competencies of an effective environmental educator we should agree on the goals/objectives for environmental education in secondary education.

Competencies required of an effective environmental educator.

(This is in addition to general knowledge, attitudes and skills expected of an effective educator)

The following groups of competencies are formulated :

- Foundational competencies in professional education.
- Competencies in environmental education content.

It will be clear that required competencies will vary per subject area and the formulation of these per subject area is a first step that should

be taken.

It will be clear that much more will be required of Science, Social Sciences, Technical subjects, Agricultural Science and Home Economics teachers. However all teachers are role models for our future generation and therefore should obtain some basic training in environmental education.

Curriculum development in teacher training programmes

A process for curriculum development in teacher training programmes preservice training programmes in environmental education may involve three approaches :

- develop a specific course in environmental education methods (emphasis on practicing methods)
- infusion of missing aspects into existing programme courses.
- addition of courses in the curriculum on missing aspects.

Ideally a preservice training programme would incorporate all three of these approaches. However constraints imposed by time, facilities and instructor expertise may necessitate otherwise.

The list of environmental education competencies can be used to analyse the existing curriculum to determine where training in specific competencies is already being achieved and where there is no training at all taking place. This kind of analysis should involve all involved in the teaching of the preservice courses.

Based on this decisions can be made on which approaches are most suitable to adopt for specific programmes.

It would be desirable in training programmes of especially science and social science, to attempt both some degree of infusion and the development of a separate environmental education methods course (as has started in DMSE). This would enhance the probability of developing competencies in environmental education and increase the general teaching effectiveness. Or, in other words, the upgrading of the quality of current teacher education programmes.

We need teacher educators who are capable of developing these competencies. Training will be required here. Suggestions for this have been made in the UB Environmental Education Project Proposal.

It is my opinion that at UB a masters degree in environmental education should be developed to train the coordinators/resource persons we need to guide the development and imple-

mentation of environmental education curricula and training of teachers.

Infusion of environmental education into Teacher Education Programmes.

The following approaches have been mentioned before :

- the introduction of an environmental education method course
- the infusion of environmental education aspects to curriculum of existing courses
- adding other courses to programme.

This conference hopefully creates a sympathy toward change, a concept of need and an affective predisposition in the right persons on the right places. Infusion implementation barriers should be identified by participants themselves.

In the UNEP-UNESCO Document 25 many infusion possibilities and examples are given, many of which are useful (with minor adaptations) for programmes in teacher education in Botswana.

Environmental education methods courses for professional education.

The International Environmental Education Programme modules of UNESCO-UNEP provide great material for development of these courses in teacher training for secondary school teachers and in a wide variety of subjects.

The environmental education course in DMSE is based on frameworks laid down in these modules.

Implementation of preservice environmental education programmes.

Changing a curriculum can be like trying to move a cemetery. The variables affecting its implementation are:

- influence/power of person(s) who coordinate/plan for infusion
- existence of inside advocates
- institution's attitude toward infusion of environmental education
- institution's possession of environmental education competencies
- availability of environmental education experts for environmental education Teacher Trainers In-service
- students' support and feedback
- availability of funds e.g. for teacher trainers in-service;
- existing curriculum
- availability of proper resources/facilities for environmental education courses
- degree of adaptation of environmental education in curricula for secondary education.

A first thing to do is to make an inventory of restraining and driving forces for each variable. After this the implementing, in which all who are affected by it, can be executed.

In-service teacher training in environmental education

In Botswana two in-service structures exist for teachers in secondary education :

- The Ministry of Education in-service system covering most subject areas based on a working force of Field Education Officers spread all over the country, visiting schools, assisting departments/individual teachers and organising workshops.
- The UB-INSET Project of the Department of Mathematics and Science Education which provides in-service to mathematics and science teachers mainly through organising workshops and peer training in follow up workshops.

Before we start with in-service (as with preservice) in environmental education the following steps should be taken:

- depending on accepted goals/objectives formulated for environmental education in secondary education required competencies can be formulated for the secondary school teachers in specific subjects;
- a needs assessment will have to show on which aspects the in-service has to focus.

After these steps have been taken existing structures (with their methods of in-service) can be mobilized.

Plans exist to start with in-service in environmental education already next year. I hope the following will be taken into consideration first:

- the in-service must be relevant for development of competencies of teachers which are required for them at the moment or in the near future;
- as soon as changes will be made in the secondary school curricula related to environ-

- mental education there will be a clear need for in-service for the added requirements;
- a thorough training will be required for those conducting the in-service and/or assistance of environmental education experts have to be sought;
- if follow up workshops (based on peer training) are organised this will only be useful after the teachers gained considerable competency in environmental education aspects, which will only be after they have had experience with the methods in their own lessons
- IEEP modules provide useful information for organising in-service in environmental education
- coordination is important as will be discussed in a later session in the conference. Consultation with existing environmental education project coordinators is essential
- the in-service activity should be fully supported by the teachers; they should be involved in the planning from the beginning.

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Health education in Botswana

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Primary health care

The Government Health Policy is the attainment of 'health for all' by the year 2000. It is expected that every inhabitant of Botswana would have attained a level of health that will allow them to lead an economically and socially productive life. Everyone will have access to essential health care.

To achieve this goal, the Ministry of Health has focused on Primary Health Care as being the most appropriate target. One of the major components of this is health education. The dominant causes of ill health are still infectious diseases and to some extent conditions associated with under-nutrition, inadequate environmental sanitation and lack of safe water supply. Health education therefore targets the conditions that lead to such infections.

Before I proceed further it may be useful to define what is meant by 'health education'. Health as defined by WHO is a 'state of complete physical, emotional and social well-being' (and not just the absence of disease and infirmity). Health education therefore concerns prevailing health problems and the methods of preventing and controlling them.

We have to distinguish between health education and information. Impromptu radio messages and posters are examples of health information. But health education is much deeper as it includes changing people's behaviour and attitudes. It is essential therefore to review the current approaches to health education to identify those that continue to be relevant today and to develop new approaches which could help in achieving the objectives of 'health for all' through Primary Health Care.

One major objective of the Primary Health Care approach is to help individuals and communities become self-reliant in dealing with health problems and to raise the effectiveness of the person's own contribution to their health. This objective calls for a people-oriented health technology that meets people's needs and aspirations. Too often in the past, modern health practices have been promoted without giving sufficient thought to their relevance to the social and cultural background of the com-

munities concerned. An effort must be made to enable individuals and communities to play an active role in the planning and delivery of health care.

To assume such a role, people need guidance and encouragement from health care providers in ways of identifying and of finding solutions to their health problems. They also should be able to set targets and translate these into simple and realistic goals that can be monitored. However, the involvement in health of individuals and communities does not absolve the health care providers from their responsibilities. These should have a thorough understanding of the 'health culture' of the communities they serve and how that culture is influenced by the dynamics of social and cultural change as well as by political and economic organisation. The change in focus of social and health education from that of individual behaviour to an approach taking into consideration the social context in which the individual lives is an important one. It is now recognised that political, economic and environmental factors have a negative effect on an individual's health. This comprehensive approach implies that health education models should be developed based on human ecology and take into account the interaction between the biological and environmental factors influencing harmonious development.

Health education and rural development

The integration of health education goals in the planning and management of environmental health programmes requires a systematic approach. Strategy formulation should emphasise the importance of integrating health education goals into other sectors such as, agriculture, housing, water development, industry, literary programmes, etc. Health is no longer the prerogative of any single group.

The National Rural Sanitation Project being popularised in the rural areas of Botswana is a good example of an integrated approach where environmental health education is of vital importance. The main objective is to encourage individuals in rural areas to construct 'improved

ventilated pit-latrines' (VIPs) with a special subsidy from the Government. The project has demonstrated a methodology for motivating rural householders to participate both in physical and financial terms in the construction of family latrines. The whole household is responsible for enrolling in programme, paying a registration fee of P30 and digging the pit according to specifications. After verification of this household task by the village sanitation coordinator, the project team builds the superstructure and returns later to install the vent pipe.

Health education was supposed to be fully integrated in the project but its delivery was poor. An evaluation showed that the provision of latrines alone did not have a direct impact on reducing the incidence of diarrhoea. Only when a pit latrine was accompanied by improved usage practices and better overall household hygiene did it make a difference. The adoption of better sanitation and hygiene has been shown to improve health. The adoption of better sanitation and hygiene practices is largely dependent on effective health education. The evaluation showed that even in household with latrines, some family members did not use them. Males, in particular, did not use the latrine to urinate and most children under-5 did not use the latrine at all. Yet the large majority of households feel that ownership of a latrine has considerable convenience value and improves the quality of life. The presence of a latrine does not necessarily mean that the oral-faecal transmission cycle is broken. Therefore, unless the personal hygiene habits of all members of the household are changed through proper health education, the incidence of diarrhoea will continue to be a problem.

The main operational principles that guide the implementations of health education are:

- A problem-based approach where the programme evolves out of analysing and solving problems identified by the target audience, trainers and specialists.
- Limiting and focusing the educational content on priority messages that are within the reach of target audience. In particular:
 - What is achievable in respect of the target audience taking into consideration the possible effects of phasing out of subsidies.
 - What is achievable for the implementing agencies in relation to the resources available to them.
 - What is likely to have the greatest impact on health standards and health status.
 - Seeking initially to achieve satisfactory standards in a small pilot stage before attempting to achieve widespread coverage.

- Phasing of implementation in accordance with available resources.
- Facilitating the health education process by recruiting and training community facilitators.
- Developing learning materials which are simple and manageable.
- Making use of multi-media approaches.

There is no doubt therefore that new policies for health education in primary health care must include clear, unequivocal recognition of the need for active involvement of the community in health planning and in the implementation and evaluation of appropriate services and technology. To fulfil its task, health education should receive a strong mandate from national policies and a commitment to the equitable distribution of health resources and provide for the integration of health education. Policies should include the utilisation of education programmes on those stages of the health care process where the effective involvement of people and their increased self reliance require additional understanding and skills.

Training programme at the National Health Institute

The National Health Institute (NHI) runs courses in Nursing for the training of Registered nurses, Enrolled nurses, and Community nurses. It also provides courses for Medical laboratory technicians, Pharmacy technicians, Dental therapists and until recently health assistants. Health education is taught in all basic courses which are compulsory. The major aim of having a health education component as a core subject at the NHI is to ensure that all health cadres have an understanding of the basic principles and methods in health education to ensure that they can mobilise the community in health activities.

At present health education is offered only as a component of the basic training courses. However, there are plans to introduce and upgrade the current status of the course. The Ministry of Health has approved and accepted a proposal by NHI to start a three year diploma in health education during NDP7. The exact date of introduction will depend on availability of teachers and financial resources.

Current elements in the health education component are as follow:

- Principles, methods and practice of health education.
- Importance of individual, family and community participation and co-operation in health education programmes, poverty issues, ethnic differences, educational levels, superstitions, etc.

- Uses of visual aids and mass media in health education.
- Principles and procedures in community organisation and diagnosis, definition and personality of the community.
- Individual and mass roles within the community and formation of health committees.

Upon completion of the formal course of studies, a graduate of the NHI programme will have acquired or developed knowledge, abilities and attitudes so that he will be able to:

- Perform professional services within a community health care system compatible with the overall policies of the Ministry of Health. In particular:
 - Identify and define present and future community health problems and work to resolve such problems by the planning, implementation and evaluation of preventive or remedial programmes.
 - Use clinical skills, knowledge, original observations and appropriate records to identify, diagnose, manage (prevent, refer or treat rationally) and follow-up the health

problems of his patients, taking into account the physical, psychological and socio-cultural aspects.

- Work as a leading partner in a health care team.
- Educate the population and motivate them to improve their health.
- Continually increase his level of competence through:
 - Take part in postgraduate training (residency programmes specialization, courses, etc) and training (students and colleagues).
 - Periodically evaluate his professional activities, recognise his educational needs, select appropriate learning resources and evaluate his progress.
- Aid the development of the health sciences by engaging in teaching and research and seek solutions to the new health problems of his patients, community or health care system with which he is not familiar.
- Maintain and develop personal characteristics and attitudes required for professional life, such as personal integrity, sense of responsibility and dependability, and ability to relate to, communicate with and show concern and respect to his patients and colleagues.

Environmental education at the Botswana College of Agriculture

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Introduction

I do not pretend to be an expert on environmental education, but I have had considerable experience in this area in the United States and I am firmly committed to the concept that much more must be done in this arena at all levels of society. Tertiary education, as the highest level of formal education, has the heavy responsibility of ensuring that graduates, regardless of their academic programme, enter their respective professions with a solid understanding of the need to address current environmental problems now, and to not continue to mortgage the ecological future of their children as my generation has done all too many times.

Environmental problems and issues cannot be relegated to just intellectual discussions over drinks and hors d'oeuvres at cocktail parties. I think all of us believe that the topic of this conference is serious and the challenge presented to us is to design educational programmes at all levels that will result in everyone becoming an environmentalist—using that term in the most positive connotation.

Though I have spoken with some department heads and faculty staff at the Botswana College of Agriculture (BCA) on the topic of environmental education, they have not read this paper and the plan proposed here has not been discussed with BCA administrators so has not yet been approved. The ideas and suggestions in this paper represent an agricultural education perspective as a contribution to this initial dialogue on environmental education. This report will be modified to reflect relevant ideas and suggestions gleaned from this Conference before it is submitted to the administrators and faculty at the BCA for their reaction and, hopefully, active implementation.

Current situation

Environmental education is not an integral part of the agricultural curriculum at the BCA at the present time. The faculty is quick to point out that the teaching of soil and water conservation, including the prevention of soil erosion, has been a traditional part of any good agricultural programme for many years and the BCA is

no exception in this regard. However, it is interesting to note that in spite of this long-standing emphasis in colleges of agriculture worldwide, soil erosion continues to be a very serious problem in almost every country. One reason for this could be that the problem of soil erosion has usually been addressed in a purely technical fashion and the cultural, social and economic aspects have been ignored.

In my opinion relationship between various agricultural management practices and the long-term impact on the environment is not sufficiently emphasized. Also, many faculty staff are not thoroughly familiar with the National Conservation Strategy (NCS), and therefore the key features of this plan related to agricultural production and management are not yet an integral part of relevant courses. Many recognize and acknowledge that they should be doing more in the area of environmental education, but they need assistance and encouragement on how to do this most effectively and efficiently.

A suggested approach

A fundamental philosophy regarding environmental education needs to be adopted by the BCA. The presenter recommends that the two main components of this philosophy should be:

- Environmental education should be integrated into existing courses and not taught as a separate subject. Teaching it as a separate subject increases the possibility that environmental issues are only discussed in that setting and are not seen as something that must be addressed by everyone in all aspects of life.
- The entire educational programme at the BCA should emphasize the development of a sustainable agricultural system for Botswana. "Sustainable agriculture" can be defined as a system of agricultural production that is ecologically sound and economically viable. This must be a balanced system of adequate agricultural production that protects and sustains the natural environment while still permitting farmers to make an adequate profit.

Convincing the faculty to agree that this is the correct guiding philosophy could be quite difficult and getting agreement on what constitutes sustainable agriculture could also be very difficult. For example, the overall benefits of the highly publicized Green Revolution are still being debated, especially in regard to its sustainability. There are critics who maintain that this programme was developed at the expense of the poor and others who will remind us that Africa was generally left out of this 'miracle development.'

Therefore, the approach of thoroughly integrating environmental education into agricultural education at the tertiary level will not be an easy task. Some of the complexity of the problem, both environmentally, economically and socially is emphasized in the following quote from the September 1989 issue of *Scientific American* which was devoted to the theme 'Managing Planet Earth': "In order for new, less damaging techniques to have an effect, they must be used. For them to be introduced at the level of the individual farm, they must benefit the farmer. In a market system, such benefit generally takes the form of profit. Yet markets are not well equipped to protect resources such as water and genetic diversity, in which it is difficult to establish property rights. In our view the most challenging problems for agricultural policy is to devise institutional mechanisms that will reward individual farmers for valuing these precious resources at their true social worth."

I would like to see Botswana avoid the polarization that took place in the United States between agriculturists and environmentalists. If any two groups should be working together it is these two. Concentrating on sustainable agriculture should put both groups on the same path leading to a sustainable society. William O Ruckelhaus, in his article 'Toward a Sustainable World' in the same September 1989 issue of *Scientific American* stated:

"Sustainability is the nascent doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense—by the interrelations of human beings and their works, the biosphere and the physical and chemical laws that govern it. The doctrine of sustainability holds too that the spread of a reasonable level of prosperity and security to the less developed nations is essential to protecting ecological balance and hence essential to the continued prosperity of the wealthy nations. It follows that environmental protection and economic development are complementary rather than antagonistic processes".

Continuing with this same line of thinking, I believe that one cannot discuss environmental

issues, whether related to agriculture or any other area, without being conscious of development issues and especially rural and urban poverty.

Poverty—worldwide—is the greatest environmental problem of all. Poor people will not be concerned with environmental problems until their basic needs are met and their level of poverty reduced. The relationship between poverty and environmental problems was addressed very effectively in an essay on 'How to Secure Our Common Future' by Gro Harlem Brundtland who was chairperson of the World Commission on Environment and Development. Quoting Ms Brundtland:

"Poverty is a major cause and also a major effect of global environmental problems. It is futile to seek solutions to environmental disturbances without considering them from a broad perspective that encompasses the factors underlying world poverty and the inequalities within and among nations. For developing countries, poverty lies at the heart of all issues. The poor are forced to eat next year's seed corn, to cut scarce forests for fuelwood. Although such practices may be rational short-term tactics for survival, in the longer term they can only result in disaster".

Yet it is both futile and an insult to the poor to tell them that they must remain in poverty to 'protect the environment.' The World Commission on Environment and Development concluded in its 1987 report, 'Our Common Future,' that sustained economic growth, which is a precondition for the elimination of mass poverty, is possible only within a more equitable international economic regime. The commission called for a new era of economic growth - growth that enhances the resource base rather than degrades it. We know now that growth and development need not be environmentally degrading; that in fact, growth can create the capital and the capacity necessary to solve environmental problems. And without growth, how can we provide for twice the present population some time in the next century, when we cannot provide for everybody today?

These comments are very germane to developing an environmental education programme for the Botswana College of Agriculture because agriculture is a fundamental industry and many graduates of the College will work for the Ministry of Agriculture or private industry and will be directly involved with all types of farmers. This will be especially true for those individuals who end up working for the Ministry of Agriculture in the area of Agricultural Extension. Therefore, a topic that needs to be developed very completely in the BCA curriculum is the complex interface between economic development and

environmental concerns. There are three essential "Es" that must be addressed Environment, Education and Economics. It is fairly easy to develop an environmental education programme for any institution if one takes a strictly academic approach, but without addressing economic issues in a straight-forward manner, it will be a case of students hearing an idealistic approach to environmental issues in the classroom and observing very different behaviour 'in the real world.' For example, students need to learn why many businesses are totally absorbed with short-term profits which are frequently at odds with environmental concerns and sustainable development. To quote economist Kenneth E Boulding,

"All of nature's systems are closed loops, while economic activities are linear and assume inexhaustible resources and 'sinks' in which to throw away our refuse."

An advisory Panel on Food Security, Agriculture, Forestry, and Environment was established in 1985 by The World Commission on Environment and Development (WCED) and was asked to indicate how humankind can be insulated from hunger on an ecologically sustainable basis. This Panel was chaired by Dr M S Swaminathan, a highly respected agriculturist, and they submitted a report to the WCED titled 'Food 2000: Global Policies for Sustainable Agriculture'. Their report contains many excellent and very viable suggestions and recommendations that have direct implication for any agricultural/environmental education programme. In discussing the role of Extension Education and the role of women, this report contained the following statements:

"Extension workers, agents of change, etc., must be able to visit villages and provide in situ training, thus developing with the farmers themselves, technologies suitable to the users and the ecosystems. In addition, peasants are thereby exposed to the successful experiences of others. The concept of field days can be extended to cover visits to other parts of the country and possibly to neighbouring countries".

"Women play a critical role in food production: in cultivation, seed selection, storage; in some regions they are the basis for successful afforestation efforts; they provide the main labour on the minifundia in Latin America, the Caribbean and Asia; in sub-Saharan Africa, women's contribution to food production is as high as 73% in some countries. Despite their important role in ecological and agricultural rehabilitation and enduring food security, in many countries they do not have direct rights to land and their rights to it are being curtailed by titles being provided to men. What technology

filters to peasants hardly reaches women; they form a tiny component of those who receive training in modern methods; their traditional knowledge, especially regarding seed, is not sought nor built upon. They are not consulted regarding community forestry".

Action plan

I believe the recommendations and philosophy contained in these statements highlight the critical fact that any environmental education programme in an agricultural institution must thoroughly integrate a solid understanding of social systems and social interactions into the technical courses. Document No. 28 in the UNESCO-UNEP Environmental Education Series lists the following principles which they suggest should be observed when incorporating environmental education into agricultural education. I believe they can also apply to the broader context of environmental education in general.

- The greater the expression of concern for environmental education by many groups and individual leaders in society, the greater the probability of success in incorporating environmental education into agricultural education.
- There must be specific individuals and organizations with responsibility for environmental education in order to provide the necessary substantive, emotional and social support to the total effort.
- The concepts of environmental education must receive support and enhancement as integral parts of many courses.
- The gains made through personal commitments to the values of environmental education are more essential to long-term success than short-term projects with dollar support.

Proposals for the future

To develop a truly sustainable agriculture is a very complex process. As staff at BCA become more familiar with the National Conservation Strategy for Botswana and other significant environmental literature such as 'Our Common Future', they should become even more aware of the significant number of inter-related and inter-dependent factors involved in the process which in turn highlights both the interdisciplinary and multidisciplinary nature of any environmental education programme.

Each academic department should develop its own plan for environmental education in its respective discipline. The College also needs to establish an Environmental Education Coordinating Committee with one representative from each academic department. To expand the interdisciplinary and multidisciplinary nature of

the BCA curriculum and to strengthen the social science input, this Committee should also include adjunct members from the Departments of Anthropology and Sociology at the University of Botswana and the National Institute of Development Research and Documentation (NIR).

This Environmental Education Coordinating Committee should be charged with the responsibility for:

- Identifying and suggesting various procedures for implementing interdisciplinary aspects of environmental education into the BCA curriculum.
- Identifying the need for specific Professional Development Workshops (PDWs) to assist the faculty staff in obtaining more information and strategies for integrating environmental education into their instructional programmes. This series of workshops should be supported by both the Minister of Agriculture and the Minister of Education. Hopefully each Minister would make strong and sincere statements of commitment to environmental education at the initial workshop.
- When necessary, the BCA should act as a catalyst for initiating seminars to discuss critical issues that could lead to desirable changes in policy and planning. These seminars should include BCA staff and students and personnel from the Ministry of Agriculture's Research Centre.
- More of the practical work should focus on the interdisciplinary and multidisciplinary aspects of environmental problems and issues. More individual student projects should have the same focus.
- In each year of a student's academic programme, there should be a weekly seminar (60 to 90 minutes long) emphasizing the problem-solving approach to real agricultural/environmental problems facing Botswana.
- Field Practical Training (FPT) assignments should concentrate on exposing students to good examples of sustainable agriculture, both on farms and in government agricultural offices. It would be better to have no FPT at all than to have students exposed to poor examples and to learn 'bad habits.'
- Ensuring that good environmental practices are followed by all personnel at the College to prevent environmental education from becoming just an interesting topic for discussion. Perhaps the members of this Committee, or other designated individuals, will have to assume the role of 'Environmental Watchdogs.' This includes providing models of appropriate technology that are ecologically acceptable, with an emphasis on the College

serving as a model for energy conservation. Efficient and effective use of solar energy, water catchment and recycling, and the maintenance of a clean and healthy living environment are just a few of the many possibilities whereby the College can teach by example. It must become a living example of action speaking, or teaching, more loudly than words.

Conclusions

This is a very heavy agenda and one of the reactions of individual faculty members could very well be, "What's in it for me"? This would be a very legitimate response and my answer would be—very significant professional recognition. This professional recognition can come from publishing how they have successfully incorporated environmental education into their respective courses, and, if they extend the suggested philosophy and action agenda to their personal research activities, there is an almost unlimited frontier of opportunities.

In closing, I want to quote two highly respected scientists and researchers, Pierre R. Crosson and Norman J. Rosenberg, who concluded their article on 'Strategies for Agriculture' with the following statement:

"It is our view that in the long run, the most successful approaches will rest on merging individual and societal interests rather than on enforcing the one over the other. This is essentially an institutional, not a technological, problem. What is lacking are forms of communication that connect the overarching interest of society in a sustainable agricultural system with the well-being of the individual farmer. Specifically, institutional mechanisms must be devised that correctly signal the emerging social scarcities of land, water and genetic diversity. Finding these mechanisms is the most important policy challenge for the world's agricultural development".

I believe these views are consistent with the theme of this presentation and, while obviously the development of an environmental education programme for the Botswana College of Agriculture is not going to solve all of Botswana's, or even a fraction of the world's, environmental or agricultural problems, it should help to produce the kind of future agricultural leaders who can help to alleviate some of the existing problems and, at the very least, not create new problems.

Environmental education in Botswana Brigades

B Swallander

Senior Technical Education Officer, BRIDEC

Introduction

There are today 26 registered Brigades in Botswana, each an autonomous entity governed by a Board of Trustees. The Brigades Development Centre (BRIDEC) offers advice and support to the Brigades and Government channels bursaries through it (about P2 200 per trainee per year). The Brigades currently have about 1 500 trainees in 11 different trades. The concept is one of 'training with production' which means that about 40% of the time is spent on theory in the classroom and 60% is on-job-training. The majority of trainees (about 70%) are involved in training in Building/Bricklaying and Carpentry. The remainder are either trained in mechanical trades such as Auto-mechanics, Welding, Plumbing, Machine fitting and Electrical or in Typing, Horticulture or Forestry.

The curriculum

Science was re-introduced as an academic subject in the Brigades syllabus three years ago in order for trainees to get a better understanding of the technical applications of Science; also included were elements of environmental education. In preparation for this paper, a letter was sent to all Brigades with the intention of finding out what environmental education activities were currently taking place. The following questions were passed:

- Have you developed any environmental education policy in your brigade?
- How do you include environmental issues in your theoretical and practical training?
- Do you have any instructions on how to work with asbestos material?
- Do you have any policy on how to treat waste material—old batteries, oil, etc?
- What sort of assistance would you like to have on environmental education activities?

So far I have not received one response, so let me try to elaborate on the possible reasons for this. The fact is that probably very few if any Brigades have a developed environmental policy and the reality is that environmental issues are not included in training programmes. Indeed,

knowledge about specific issues such as asbestos hazards is probably very low among instructors as well as trainees.

In wholesale and retail outlets, colourful brochures usually dwell on the advantages of products, but little warning about the risks of working with the material is included. In addition, proper protective clothing and handling of the material is often neglected; such precautions often appear to complicate and hamper the job.

Regrettably there is little knowledge about working with dangerous materials such as asbestos, yet to use them safely, a number of things are required such as knowing the hazards of the product, knowing the precautions to be taken and finally, observing those precautions

To take a specific example, battery suppliers do buy back old batteries as 'trade-ins' for new ones. However, most batteries are probably just retained and later dumped. Waste oil is often burnt or dumped although there is a market for its use in treating poles for fences.

The future

To be able inform trainees about protection of themselves and the environment it is first necessary for instructors to have basic knowledge about the issues concerned. A conference like this can serve as an Initiator by alerting decision makers to the problem of sensitisation and training of instructors and stressing that action is required urgently. From this first step, action plans can be developed on how to tackle the task ahead. People will ask why such action is necessary and so they need to be well informed. This is where the involvement of the Brigades instructors must be encouraged.

It is also important to realize that the Brigades train a practical work force—our builders, carpenters and other craftsmen. Teaching only the basics of environmental education can be attempted. A more complete understanding of environmental issues probably needs a broad base in the Natural Sciences, Statistics and Economic, as well as a trained mind in abstract thinking. Few people at the moment have these pre-requisites, but this should not prevent the Brigades from addressing environmental issues.

Existing and planned environmental education activities in technical institutions, particularly the Botswana Polytechnic

S A Manchisi

Lecturer, Botswana Polytechnic

Introduction

In this paper I focus on the Botswana Polytechnic though many of the comments are relevant to Vocational Training Colleges (VTCs). The students in the first year programmes in technical institutions come from different educational backgrounds. The majority of the Polytechnic students come from secondary schools after completing Junior, Certificate or Cambridge Overseas School Certificate, but some are already in employment in both Government and private sectors. In some institutions, places are also offered to non-citizen students wanting to study in this country.

Current status of environmental education

Students follow specialised syllabi from both local and overseas bodies. For example, most students at the Botswana Polytechnic follow the United Kingdom's City and Guilds Syllabi which consider topics in great depth but with little emphasis put on environmental issues except in certain Science courses. An analysis of environmental themes in the following departments at Botswana Polytechnic reveals the following:

- Electrical Engineering—The Science Laboratory Assistants Certificate contains separate topics in Environmental Science. In the Science Laboratory Technicians programme, Environmental Chemistry is taught along with Chemistry.
- Civil Engineering—Students in the Diploma in Land Use Studies (DLUS) cover many environmental issues. At the end of their first year they sit Part I in Environmental Studies and write their Part II examinations in their second year. There are some elements of environmental education in other courses but these are not well defined.
- Mechanical Engineering—There are no separate topics covering environmental issues, although there are topics on environmental related problems in most courses.
- Teacher Education—In the BEd Design and Technology some environmental issues are mentioned but environmental education receives little emphasis.

In conclusion, environmental education is not stressed at Botswana Polytechnic though certain programmes touch upon it in those departments mentioned above. The external examining body, City and Guilds probably does not consider environmental education important for technical colleges. Even in our newly introduced locally devised degree programmes, there are only a few elements of environmental education.

Reasons for lack of emphasis in environmental education in technical institutions

To design programmes of environmental education in technical colleges is problematic. The following are the main reasons why this is so:

- The depth of the existing syllabi and time pressures related to this (for example, City and Guilds) complicates the task of introducing environmental education.
- The design of environmental education courses in these technical institutions is difficult because of specialization and differences in subject matter taught in various departments or sections.
- The organization and implementation of programmes of technical education varies greatly from country to country and there appears to be limited exchange of ideas.
- Knowledge acquired only a few years ago is rapidly outdated as new technologies are introduced, new tools acquired, new materials are added to traditional ones or replace them. It is difficult to keep pace with technological innovations, never mind teach about their environmental impact.

Despite these problems, considering the importance of environmental issues to the engineers of tomorrow, both in industry and other related fields, technical institutions should consider introducing elements of environmental education. These would greatly benefit students who on completion of their courses become supervisors and work directly with tradesmen

along with general workers. If a supervisor is aware of environmental problems he will also assess risks at his work place and take appropriate measures to avoid them, both for himself and his fellow workers.

Aims of environmental education in technical institutions

Almost daily there are accounts in the press about the negative effects of industry and other fields of economic activity on the environment. For instance, new materials and equipment are introduced without prior regard to the side-effects which they may have on those who will use them directly in their work or on passive bystanders. Air pollutants in particular know no boundaries and dust particles and other impurities or poisonous elements often create unhealthy conditions for workers and for people in surrounding areas.

The usual explanation given to this accelerating environmental destruction—the accidents that occur, the destructive side-effects of many activities our modern society is that 'the human factor' is to blame. This factor can be translated into 'ignorance and negligence'. Somewhere along the line of actions leading to environmental damage are engineers, technicians, foremen and workers who do not know, or who do not understand, or who do perhaps not care what effects there can be. Their actual job may be in design, maintenance or management and planning. Each has a responsibility for the health safety of the workforce and the condition of the environment.

To combat this widespread ignorance of environmental issues, people must be equipped with the knowledge and skills needed for dealing with them. In addition they should convey to others the sense of responsibility necessary for proper application of these skills and knowledge. These to my mind are the principal objectives of environmental education in tertiary education, and they are particularly important because of the key roles of the engineers, technicians, foremen, supervisors and workers in reducing and eliminating negative environmental effects. If we attach special importance to environmental education we shall combat these threats to the human environment.

Engineers and technicians are the principal graduates of technical institutions and it is these graduates who need special environmental education for two different reasons:

- they take part in the development and production processes which markedly influence the human environment and
- like any other human being, are directly affected by that environment.

It is for these reasons that environmental education should form part of a technical education process. Syllabi and programmes of environmental education must be designed for both young men and women receiving their initial technical education and those who are already employed.

The graduates of tomorrow will be employed in a huge variety of technical areas. This diversity means that environmental education must be specifically targeted to well defined fields of activity with clear definition of priority issues in environmental protection and improvement.

The aims of environmental education should therefore be to:

- the production 'environment-friendly' technology. One aspect is the design of this type of technology, another would relate to the disposal of liquid and solid waste products of it.
- the improvement of health and safety. Many of our graduates will be required to assess risks in the work place and must be aware of the impact of technology on health and environment.

If technical personnel are to help minimize environmental risks, they need to learn to appreciate, identify and evaluate the effects of their professional work on the environment. In particular they need to be aware of the environmental properties of the raw materials they are using, the process which they are designing or controlling, and the risks to those who perform them.

My own view is that the term 'our environment' can be subdivided into two elements:

- the outer environment, which is simply the 'world around us' and
- the inner environment, which is the work place.

The issues relating to the outer environment are of special importance to technical staff as they control the impact of technology on the quality of life on earth, by the type of activity in which they are engaged. The issues in the outer environment range from waste disposal, through to land reclamation and material recycling.

Environmental education relating to the inner environment has a different emphasis—common features are knowledge of poisonous elements used in the work processes, equipment related risks, organizational risks, process-related risks and product-related risks. Rapid technological development, particularly, in the chemical

industry and other related fields and the development of new products make it necessary for technical personnel to update themselves regularly on health and safety issues.

Other environmental activities in technical institutions

In our institutions, the goal should not only be to teach environmental education, but also to be involved in other activities related to the environment such as:

- Formation of Health, Safety and Environment Committees. Their aims would be:
 - to review health and safety policies and environmental issues and their impact on students and staff as well as on the public.
 - to arrange seminars, meetings and site visits including teaching specialised topics on environmental issues on certain courses.Other bodies such as Wildlife Societies and Conservation Clubs could be involved.

- Identification of Reference Departments/or groups with specialist knowledge whose functions would be:
 - to advise people on specific dangers of certain substances and how to dispose them safely.
 - to review the means of policing the inner and outer environment to identify dangerous substances.

Much can be achieved if technical institutions work together in this venture. With the help and encouragement from Government and other sectors including the University of Botswana, I am sure we can make the Southern African countries and Botswana in particular, safer and cleaner places to live in. It would require the co-operation of all SADCC member countries, and also South Africa. This regional approach is essential since water and air pollutants are not restricted by international boundaries.

Existing and planned environmental education activities in university education

O Totolo

Environmental Science Department, University of Botswana

Introduction

The term "environment" is a complex concept, the dictionary definition being "that which encompasses surrounding objects" or "the sum of all external influences affecting an organism." We must perforce look at the concept from a human point of view, so our environment is our home, 'the Earth and all that's in it—organic life and inanimate matter'. Inescapably, therefore, we are an integral part of this totality; whatever we do has influence and impact from which we cannot in any way escape. That influence can be utterly baleful—or it can be benign. Regrettably to date it has tended to be the former rather than the latter.

Environmental education on the other hand refers to teaching people how to impart information about the environment: in other words extension work. Students are taught skills and techniques of imparting information about the environment. Therefore before one could become an environmental educationist it is necessary first to study the environment.

The situation at the University of Botswana

Proceeding from the above premise it could be said that there are at least seven University departments which are teaching about researching on aspects of the environment:

- Environmental Science
- Biology
- The Pre-Entry Science Department
- Physics
- Chemistry
- Environmental Research at National Institute of Development Research and Documentation.

Although each department has a mandate to teach about the environment in their own way I think there is a need for all the above departments to work closer together in order to foster a better understanding of the environment. At the moment teaching about the environment is disconnected and not well co-ordinated between the different University departments. Personally I advocate that students choose an environmen-

tal course from any department. I must emphasize that at the moment only the subject matter on the environment is being taught by the above departments. There are a few departments within the Faculty of Education which are actually providing aspects of environmental education. These are the Departments of Mathematics and Science Education and Languages and Social Sciences.

I would briefly to outline how each department mentioned above teaches about the environment.

Environmental science

The Department teaches students from all faculties (Education, Social Sciences, Humanities and Science). The major aims of the department are:

- to develop an understanding of the physical or natural environment, the human or man-made environment; and the intimate relationship between the two
- to impart the skills and methodologies required to describe and assess the physical and human environment.
- to introduce the idea and concepts of rational environmental planning and management as they pertain to the sustainable use of natural resources.

The Department of Environmental Science offers the following courses;

- Introduction to Man/Environment relationships
- Human Environment—Population and migration, Settlements, Economics geography, Environmental planning theory and practice, and Urban design and planning
- Physical Environment—Landforms and geomorphology, Water (hydrology), soils, Climate and Ecology
- Applied Studies—Natural resource utilisation and conservation, Environmental hazards, Land resources survey and assessment, Land use planning, and Regional development and planning

- Practical Techniques—Map interpretation, Cartographic design and construction, Statistical analysis of environmental data and the interpretation and use of air photo and satellite remote sensing and environmental assessment and planning
- M.Sc Environmental Planning

Physics Department

The department offers several courses related to the environment to undergraduates:

- Environmental Physics
- Agricultural Physics
- Energy Physics
- Atmospheric Physics

The department will soon offer an M.Sc containing the following postgraduate courses:

- Energy Physics
- Environmental Physics
- Agricultural Physics
- Atmospheric Physics
- Physics of the Earth
- Seismology

Pre-Entry Science Department

The Biology component of the Pre-Entry Science Course contains a number of environmental aspects within its Ecology Units (which in total covers about 40% of the curriculum). Apart from a basic introduction to ecology, there are three major ecological problem areas focused upon:

- Population growth (modelling of exponential growth, comparing growth patterns of different organisms, various methods of estimation of population size).
- Vegetation analysis on livestock range: carrying capacity, stocking rates of grazing land and effect of overstocking.
- The ecosystem concept (food chains and webs, energy flow and nutrient cycling, simple stability considerations, man's interference with ecosystems) using Botswana examples such as pollution of fresh water ecosystems and the Okavango.

In addition, each year students carry out major projects within the Language and Study Skills (LSS) component of PESC assisted by other sections. These constitute a major part of the LSS curriculum and extend over a period of about 2 months. Students are offered a choice of about 20 topics of a 'Science and Society' nature and many of them have a pronounced environmental education aspect.

Examples of the 1991 topics are The Sua Pan

Project, Industrial Pollution in Botswana, 'Natural insecticides, Water in Botswana, Man-made lakes in Africa, Water purification at Gaborone Dam, Alternative sources of energy in Botswana, The Gaborone sewage system .

Biology Department

The Department of Biology teaches about the environment under the following course headings:

- Applied Biology e.g. pasture management
- Ecology: The structure and functions of populations, communities and ecosystems.

Chemistry Department

In addition to teaching analytical techniques, the Department covers the following topics on the environment under special topics:

- Pollution
- Water/Soils

The National Institute of Development Research and Documentation

The Environmental Research Unit focuses on three fields:

- Forestry and fuelwood
- Land use and soil erosion:
- Veld products

In forestry and fuelwood, attempts are made to study the availability of wood from natural woodland, the production rates of indigenous trees in natural woodland and under coppice management in plantations, aspects governing the germination establishment of indigenous trees. Attention is also paid to socio-economic aspects of fuelwood consumption and trade.

The research on landuse and soil erosion focuses on various aspects of landuse such as the distribution of land for arable farming grazing, the impact of the expansion of grazing activities on the environment in West Ngamiland in the late seventies, the impact of fuelwood harvesting on the woodland in the Dukwe settlement. In addition to these, the focus has been expanded to include studies on biological means of combating soil erosion by water and wind.

In the field of veld products, a major study has been undertaken on the production ecology of the Grapple plant and the socio-economic aspect of the trade in Grapple products. The study aimed at developing harvesting methods for the Grapple plant on a sustainable basis to harvest of the plant and thereby ensure and safeguard a sustainable income for the rural population in Kgalagadi. The suggestions developed from this study are presently implemented

by Thusano Lefatsheng a non-profit making organization for rural development.

Environmental education content in other faculties

The Department of Mathematics and Science Education is at present looking into ways of incorporating environmental education into its various programmes. In addition, the Department of Languages and Social Science Education (LSS) teaches the following topics in undergraduate programmes which involve environmental issues.

- Population
- Resources and economy
- Settlement
- Political geography
- Energy resources
- Mining across the globe
- Cattle industry

The LSS Department also offer an MEd degree including the following components:

- The nature of environmental education and the relationship with environmental problems in Botswana.
- The place of the environment in relation to the Social Studies curriculum.
- Environmental problems in Botswana such as the natural environmental problems, man-made environmental problems both rural and urban
- Policies for action in Botswana Africa and the rest of the world.

Emphasizing the multi-disciplinary approach to environmental education, the Departments of Environmental Science and Languages and Social Science Education are currently involved in a discussion to start a Masters' programme in Environmental Education. This course is mainly designed for secondary school teachers who have in the past applied for the MSc in Environmental Planning currently offered by the Department of Environmental Science. A Masters programme in Environmental Education is a key development because it will foster inter-departmental teaching between University departments.

Extra-curricular initiatives

There are various initiatives by individuals or groups who are striving for a better quality environment and sensible use of resources. Within the University there is a student environment group known as the 'Environmental Conservation Society'. This group was formed four years ago and they have been involved in

disseminating information on the environment and organising field excursions, speakers and debates. They recently organised a panel discussion - on the 'Dredging of the Okavango' which is one of the more controversial environmental issues in Botswana.

Of late, the group has been addressing the questions of environmental pollution, resources conservation and recycling. In co-operation with the Student Representative Council, the Environmental Conservation Society successfully managed to persuade the UB administration to declare Wednesday 25th September 1991 a 'clean-up day'. This is a healthy and positive step towards achieving a cleaner and a better quality Gaborone environment.

There are some individuals within and outside the University who are at present working very hard to establish a National Environment Group whose key aim would be to monitor and protect the environment. The group hopes to work hand in hand with members of the Environmental Liaison Group and to fill gaps where there other groups are not operating. Botswana's urban environment is a relatively new phenomenon and there are many environmental problems which have beset it. The major problem which confront Botswana's urban centres are littering and pollution i.e improper waste disposal. There is a clear need for more recycling and better resource conservation. The group hopes to address all these issues.

Another objective is to encourage the adoption and effective implementation of legislation and policies which promote environmentally sound technologies, resource utilization and waste disposal practices. For example, drinks can ring pulls have been banned in many parts of Europe and North America because they are a threat to small children and animals but the same companies are manufacturing cans with ring pulls in countries like Botswana, apparently for advertisement purposes. The group hopes to lobby legislators to abolish ring pulls.

At the moment, Metal Box Botswana is recycling cans but for every 850-900 cans it pays only 80 thebe. This reward is just too low and the group hopes to encourage Government or a donor to match Metal Box thebe by thebe. This would be an effective remedy to clean up our environment. The group intends to encourage good management and give advice on methods of waste disposal. At the moment the City Council is crude dumping at Gaborone dump with little management. Sanitary landfill is a better alternative which will leave our environment in a much safer condition.

Environmental education is a multi-disciplinary subject and aspects should be taught by several different departments. Man is part of the

environment and therefore should exist in harmony with his surroundings. If we do not behave in an environmentally friendly manner, we could destroy our very existence. All University students should be taught about the environment and the importance of taking care of it; whether they be Chemists, Biologists, Historians, Managers or Administrators, their actions and way of life have an impact on the environment. All citizens should be targeted for environmental awareness programmes to change their way of life. Those responsible for decision-making at whatever level should always consider the environment as their main priority.

The goal is to produce a better, healthier and friendlier World. Therefore I would like the Conference to adopt the statement from the final report of the Tbilisi conference in 1987 that

“Environmental education must be regarded as a permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills and determination which will enable them to act individually and collectively to solve present and future environmental problems.”

Curriculum flexibility and environmental education

T T Mokoena

Dean of the Faculty of Science, University of Botswana

Introduction

I have redefined my terms of reference as stated in the title suggested by the organisers and in a very simple way have tried to indicate a possible model by which environmental education could be introduced into the curricula of the University of Botswana. In a broader more general sense the model provides guidelines for in the integration of environmental education in the tertiary level curricula of Botswana's educational system, be it at the Polytechnic, University or College of Agriculture. The presentation focuses on a specific and rather restricted area of implementation rather than on the formulation or articulation of a policy of environmental education. It actually presupposes something which does not exist since there is as yet no national policy on environmental education. This is why we are gathered here to start working towards it. So in thinking about curricula flexibility one is taking a leap into the unknown, and it is therefore understandable that it is difficult to give anything but a brief presentation. It is also a restricted treatment because obviously very important areas of the primary and the secondary school curriculum are omitted, nor is it in my brief to consider the non-formal sector.

Environmental education and basic education

I begin with the commonly accepted definition of environmental education which originated at the Tbilisi Conference in 1987 "a permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experience and also the determination which will enable them to act—individually and collectively—to solve present and future environmental problems."

Looking at the definition one first should identify the prime characteristics of environmental education. First of all there is the fundamental assumption that it is a lifelong process. Secondly, it can be looked at as being either inter- or multi- disciplinary, and that is tied to the delivery mode that you will ultimately

choose. In the third place it can be characterised as seeking practical solutions to our environmental problems. In other words—every person who has benefitted from proper environmental education should be in a position to articulate practical solutions to problems of the environment. Finally, and perhaps very obviously, it involves everybody, man, woman, child, professional, non-professional—all people in all sectors.

What struck me about this working definition, was that it links up with a planning conference which was held only in June of this year on 'Basic Education in Botswana' as a follow up to the 'World Conference on Education For All' held in Thailand in 1990. Here, in June of 1991, participants were grappling with the notion of 'basic education' and its essential components. Before going further, I'll share with you a very brief summary of the backbone of basic education as understood in Botswana.

At the end of the conference, essentially three notions were reaffirmed. First, the conference accepted Article I of the World Declaration from Thailand in 1990 which said that basic education is defined as encompassing the basic learning needs of all human beings. It also reaffirmed the 1977 Government Paper No. 1 indicating that basic education in the formal sector in Botswana is the first nine years of school. One aspect of basic education to note in passing was that it should endow people with the capacity for productive participation in the world of work.

The second major resolution was that the appropriate institutional framework must be provided and institutional components coordinated to ensure that learners can progress through the system. There then followed a third and embracing statement that basic education is the right of every Botswana, (the Conference noted that the disabled tended not to receive adequate attention, and made specific reference to them). What is striking is the fact that there was no specific reference or even fleeting reference to environmental education in the whole conference. Yet environmental education in terms of the agreed definition must be an essen-

tial component of basic education.

When a national policy on environmental education is being formulated, the high level participants of the June conference will need convincing that environmental education should be worked into the concept of basic education. In other words, it is important to link in environmental education at the policy level to become an essential part of the fabric of the educational system.

Environmental education at tertiary level

Returning to the definition of environmental education the next step is to move on to the essential content of environmental education at tertiary level. First of all, to be able to arrive at a policy on environmental education, there would need to be research done into existing environmental studies in order to inform the policy makers themselves about the nature of environmental education. The second area which will have to be addressed by tertiary level institutions is the crucial area of the training of teachers in environmental education since they form the essential part of the feedback loop into the school system. This will be the concern of the teacher educators. Then there is the technical/technological area addressed by earlier speakers. Then there is the area of specialism called Environmental Science; the area that we habitually associate with the endeavours of our colleagues in Environmental Science (Geography) and Biology departments.

If we look at the implications of some of the policies, the legal aspects of environmental policy also need to be covered, so that a Department of Law for example, should not feel itself immune to considering environmental issues. The economics of environment are also important, and then of course in classical physics, topics such as renewable energy. This is not an exhaustive list, but picks out key players in order to indicate that environmental education should permeate the fabric of all the conventional disciplines.

The current situation at the University of Botswana

In addressing curricula in tertiary level institutions I have decided to focus on the environment that I know best which is the university. Consulting the University Calendar I first looked at the two Faculties expected to be involved in environmental courses; namely Education and Science. Starting with the MEd programme which has a host of specialisations from adult education through to religious education, only the primary education MEd specialisation has a small reference to environmental matters in one particular elective half-course. Currently there-

fore, within the education delivery system of the Faculty Education it is just the Primary Education Department which teaches aspects of the environment.

Ironically, at Bachelors level in the BEd Science, there is a deliberate policy preventing students taking environmental science as a teaching subject alongside education in years 3 and 4. Students can only take it in year 2 as a filler. Nonetheless they do have a course offered on the education side called 'Man Resources and the Environment' but that is just one environmental course in the whole of the three year offering. The other Science Education degree listed (BEd Sci Ed) is an in-service degree and it offers the same course, 'Man Resources and the Environment'. Lastly, in adult education, which has some very interesting courses regarding curriculum development, there is no mention of the environment.

Turning to the Faculty of Science, our lead department there is the Environmental Science Department. The MSc in Environmental Planning has been covered earlier by Mr Totolo and he has already mentioned the specific course in Biology.

Physics has applied physics option, offering three courses, which have environmental components. Embedded in the Biology component of the Pre-Entry Science Course is a Science and Society section which deals with the topics such as pollution and population.

Looking briefly at other Faculties: in the Humanities, it is only when students come in contact with Environmental Science (which is taught across the Faculty) that we see any indication that they are aware of their actual environment. In the Social Sciences, the two Masters degree programmes make no reference specifically to the environment. The LLB programme again makes no reference to matters environmental nor do the BCom the Bachelor of Social Work or the BA Humanities. This concludes a quick survey of the programmes on offer.

Curricula flexibility—the various options

In addressing curricula flexibility, I thought it would be useful to mention what system UB uses for delivering environmental education at present. The University uses what is termed the "subject system". Examined more carefully, there are aspects of it that are different from the classical subject system, but it is characterised by teaching being done within the confines of a discipline and these are the conventional disciplines as we know them—Biology, Physics. This means that there is little scope for the cross disciplinarity that we have already seen is one of the hallmarks of environmental education. To be more accurate, I should indicate to you that

the way we actually run our subject system in this university is less inflexible than the description that I have given. In practice, the definition of a subject can be broad—for example the subject 'chemistry' is made up not only of the normal conventional chemistry but also includes a biochemistry course. This is a legacy of the earlier system we used to have which had lasted about a decade until academic year 1979/1980—the 'Course Unit System'. That is often called the North American system, while the subject system is the conventional British approach. I say 'conventional' because I happen to be somebody who studied under a unit system in a British university, but this was regarded as a strange novelty.

With the course unit system students are allowed more flexibility of choice comparable to a 'supermarket of subjects'. There are usually constraints: they require prerequisite qualifications and in certain cases if it felt pedagogically important, another subject can be defined as a co-requisite. In order to satisfy the fundamental requirement of most universities that their products should emerge with an identifiable skill in a certain discipline, in a course unit system there is a certain irreducible core of units which must be taken in order to meet the minimum qualification for majoring in a particular subject. In principle, provided the students have the qualifications, they could 'pick off the shelf', but there was a constraint that certain course units perhaps a minimum of 24 out of 36 were specified. The Course Unit System enabled some students in Science in years gone by to study a second language alongside their chemistry courses.

Under the subject system the advantage is that the product has acquired a skill in a well defined area. Secondly this is cost effective because all people who do chemistry will do one set of courses, and therefore rather less is spent on the degree programme. The advantage of the course unit system is its inherent flexibility: in a situation where one is moving towards multi or inter-disciplinarity, it is the answer provided the fundamental issue of a certain core, a body of study is contained within the eventual subject, be it biogeography or whatever.

The disadvantages which were perceived within this University at that time were the emergence of what could be called a 'supermarket type of graduate'—they've got everything but are nothing; there was no focus. The second criticism was that it was a rather expensive: a first world way of organising subject material because if somebody is allowed to take quantum chemistry, while another takes quantum physics, then there must be lecturers who are ready and available to undertake the teaching of small

groups as people fine-tune their career options. The question asked at the time was whether the country had reached a stage of development where one could justify that degree of fine tuning beyond the irreducible core. In fact it was felt necessary to move to the present subject system.

Evaluation of the status of environmental education at UB and future prospects

I now look briefly at how successful we have been in our environmental education offerings at the University to date. The inflexibility of the subject system aside, my assessment is that the UB record in this area has been at best patchy. The Faculty of Science is most clearly identified as participating in environmental education, in the specialist sense already indicated. The Faculty of Education has nodded in that direction, given the couple or so courses lodged in degree programmes; even then those are the degree programmes which tend to be closer to the sciences. Furthermore, there is no indication within the institution of an underlying environmental education theme or commitment—except historically a Geography Department which was renamed Environmental Science.

There are various reasons for the low profile of environmental education. First of all, as indicated earlier, there is no national policy on environmental education and therefore no university policy either. Even without a university policy, a national one could have been a guiding light. Secondly, the whole question of environmental awareness is seen by many as a fashionable area; donors are throwing money at the environment (and gender issues; so an environmentally and gender oriented researcher seems assured of project money). At the University there is an old fashioned, conventional attitude which characterises many of the administrators and staff themselves. There is as yet no real awareness of the all pervasive nature of environmental education in its proper sense in terms of the definition earlier. Further, the subject delivery is run in the conventional disciplines so there is no day-to-day encouragement to look beyond some of these conventional boundaries - between for example, Law and Chemistry. But that having been said, the University is beginning to move in the direction of delivering environmental education with the Faculty of Education taking the lead.

If we are to offer environmental education characterised by those hallmarks indicated earlier, there are three models through which it can be achieved—these I call the options. The first or 'top down' approach is where you decide that there will be compulsory courses in envi-

ronmental education delivered by environmental education specialists - the 'inter-disciplinary approach'. The second option is what I call the horizontal or sideways approach where concepts of environmental education are woven into your own subjects; thus environmental issues are delivered within the subject areas—the 'multi-disciplinary' approach. The third option is a blend of the two where the vertical approach is used but in selected key areas which overlap. I associate options 1 and 3 with what I would call a course unit system and option 2 the UB semi-flexible subject system, but this is still possible under a conventional subject system.

This is not the first time that the University has had to consider 'new' subjects or 'new' ways of looking at a discipline. For example, English and Study Skills is offered across the university because it is felt to be an essential to develop the learning skills of students. In addition, it has recently embarked on computer awareness and computing courses which sweep across the university and has recently been addressing the whole question of gender issues university-wide. Two courses recently—the BEd Nursing and a Bachelor of Social Work also have essential components drawn from other disciplines.

On the basis of these experiences I conclude that we could learn the following lessons: when there is the need to introduce a new way of teaching or a 'new' subject, policy guidelines are necessary. Secondly, it is crucial to 'reach and brainwash' the people who matter. Thirdly, as witnessed when nursing education and social work tried to start on a grand scale (and to some extent with computer awareness), it's best to start out on a small scale. Last but not least, it is important to monitor and evaluate closely.

Conclusions

To close I have some suggestions which relate specifically to the introduction of environmental education into the curriculum of the University and some more general points. I believe we should start out by using option 3 - a blend of inter-disciplinary and multi-disciplinary approaches. At the undergraduate level this is workable, and not too revolutionary, and will get things moving in the right direction. To focus on key areas, then teacher education is critical, both pre-service and in-service. We should also pick out and develop a specialist area at the interface of the work of the Science Departments associated with the environment and also use the Masters in environmental education to research into the teaching approaches in both these areas. In time, as an ideal, the University should move towards option 2—the multi-disciplinary approach where elements of environmental education are woven into every course as staff take on the same concern for the planet.

At a national level we should use this conference to create the framework for formulating the national policy on environmental education. There will be a need for much more consultative work beyond conference itself to produce the strategy which will eventually mirror a policy such as the NCS. But that doesn't prevent the tertiary sector moving towards that goal; organising awareness workshops and using other means to awaken the teaching and administrative staff of our institutions to the importance of environmental education. After that, one is then in a stronger position to institutionalise the new philosophies whatever the institution concerned.

The role of Government departments in non-formal environmental education

Mr S Sekhobo

Adult Education Officer, Department of Non-Formal Education, Ministry of Education

Introduction

For the purpose of this discussion I shall start by defining the concept non formal education as 'any organised educational activities outside the formal education system that are intended to serve identifiable learning needs of particular sub groups in the community, be they children, youths or adults.'

This is an all embracing definition covers the work of the Department of Non Formal Education (DNFE) as well as that of other departments and Non Governmental Organisations (NGOs) that provide programmes which are meant to meet specific needs of individuals, communities and the nation as a whole. Thus defined, non formal education includes, for example, agricultural extension and farmer training programmes, adult literacy, youth clubs, and various community programmes of instruction in health, nutrition, and family planning.

It is at this juncture that I shall explain in brief the duties of the DNFE to clear the misconception that the DNFE is the sole provider of non formal education in this country. As a matter of fact DNFE is operating two components of the non formal education system and these are the National Literacy Programme and the Distance Education Programme. In fact non formal education with its wide scope and large target audience is a fertile and promising field for fulfilling the purpose of inculcating awareness, knowledge, skills, commitments and actions on the part of individuals and groups for the protection and improvement of the environment and its quality for the present and future generations.

The development of non formal environmental education requires the incorporation of environmental education objectives, concepts, teaching methods and evaluation techniques into all processes of the non formal education system. In order to facilitate the development of non formal environmental education in this country, it is essential to develop some guidelines to serve as a discussion guide particularly in this conference in which key personnel shall be focusing on the task of how to environmentalize their non-formal education structure

both at the national and local levels. However, I hope that these guidelines will be specified and operationalised to form part of the recommendations which will be presented later during the course of this conference.

The successful management of the environment depends upon the co-operation of various Government departments, NGOs and informed citizens acting either individually or collectively. Intelligent and effective citizen participation in environmental conservation requires knowledge from the sciences, social science and humanities. It further requires the development of practical skills which can assist people to live in a manner which enhances environmental quality and reduced environmental degradation. Environmental education must be envisaged as a life-long process and consequently non formal environmental education is of the utmost importance in creating a society whose citizens are knowledgeable enough to make a valid contribution to the decision making process.

The role of Government departments in non-formal environmental education

The nature and dimensions of environmental problems facing Botswana are such that they impinge on a whole range of social and economic development activities. This is true especially concerning the areas of natural resource utilisation and conservation whose responsibilities fall within the jurisdiction of departments represented in this conference. For example, the core of the agricultural strategy are efforts to explore resources without causing long term damage. Similarly, the wildlife utilization strategy emphasises careful management in view of the heavy demands on the life support ecosystem dictated by the widespread and predominant wildlife.

The basic tenet of the policy on energy is the envisaged reduction in deforestation caused by the indiscriminate and excessive collection of firewood.

With respect to the mining industry and infrastructural development, it has to be borne in mind and appreciated that there are constraints of a serious and long term nature,

because of the finite and non renewable nature of the basic natural resources involved as well as the implications of their utilization on the environment. The utilization of minerals must of necessity be guided by careful planning and foresight, so that the benefits to be gained from them can be stretched to the maximum possible extent without the unnecessary waste and destruction.

The discussion of the conservation of natural resources in Botswana without specific reference to water would no doubt be incomplete. This is especially true because of the scarcity and diminishing nature of water resources in the country.

As a matter of fact the National Policy on Natural Resources Conservation and Development stipulates five main environmental problems/issues which form the basis of development programmes and activities mandated to most of Government departments represented here. These to a large extent require solutions through the non formal environmental education strategy and the five main problems/issues are as follows:

- The growing pressure on water resources resulting from increases in population, urbanisation and development.
- The degradation of rangeland pasture resources due to a variety of management and other factors.
- The depletion of wood resources due to commercial harvesting of forests and as the main source of domestic fuel in most settlements. Wood harvesting has been largely undertaken in an uncontrolled manner.
- An over-use or exploitation of some veld products such as fruits, fungi, tubers etc.
- Pollution of air, water, soil and vegetation resources. As a result human life support systems in both urban and rural environments are affected.

Environmental education and public understanding

It seems evident that lack of awareness of environmental problems facing Botswana poses an even more formidable obstacle and challenge to achieving natural resources conservation. There is every reason to believe that a significant number of people (especially in the rural areas) are not aware or have not perceived the imminent dangers arising from environmental degradation and the consequent loss of productivity in the face of rapidly growing human population. In the process, ecosystems and species are being destroyed because people do not see that it is their best and long term interest not to destroy them.

Education in Botswana is dispensed through three basic modes of informal, formal and non formal. Botswana learn primarily from day to day experiences and from the multitude of educative forces including the family and neighbours, at work and through religious activities, at the market place, at the kgotla, through newspapers, books, radio broadcasts and the folk media. This mode of learning is what is referred to as informal education. Non formal education in this country is mainly concerned with the provision of part time and largely voluntary education for the out of school youth and adults who have not had the benefit of formal education. The formal mode of learning is the most familiar education system.

Target groups for non formal environmental education

It has to be reiterated that conservation of the natural resources is the responsibility of every citizen and non citizen of this country and that a proper understanding of the environment should be regarded as part of the essential survival tool to be possessed by every Motswana. The worth and effectiveness of a well designed non formal environmental education programme would be its latitude to accommodate the needs, interests, background, mental development and receptiveness of the particular target group for whom it is intended. Thus the main target groups for the non formal environmental education programme in Botswana could fall into the following broad categories:

- Political and traditional authorities and development workers
- Youths who have never been to school
- Primary and secondary education drop-outs or new readers and/or participants in the National Literacy Programme
- Adults who have passed through the formal education sector
- Adults who have never attended school or do not possess any literacy skills; and
- Special groups such as grass cutters, wood cutters, hunters, traditional doctors and other groups who gather natural resources for commercial purposes

Institutional machinery for achieving non formal environmental education

The greatest challenge for achieving non formal environmental education lies in the non formal sector where the target groups consist of large numbers of illiterate or semi literate adults, many of them working on the land, who are already set in their traditional ways and attitudes. However, the DNFE has through its National Literacy Programme embarked on

incorporating environmental education through its functional literacy. For example, the teaching-learning process in the National Literacy Programme is undertaken in the context of developmental issues of relevance to participants. The content of the primers and follow-up booklets is thus built around problems identified in district plans and based on social, cultural and economic issues taking into account environmental differences. Learning groups facilitated by group leaders engage in discussions based on key words such as *leuba* (drought) *dikgong* (firewood) *metsi* (water) *lema* (plough), *malele* (littering) and so on. The result will therefore be the acquisition of both literacy and other survival skills as well as the stimulation of critical consciousness about essential social issues, such as usage of such resources as trees and water and so on.

Another Government department whose role in environmental education can be cited is the National Museum. Although its provision of environmental education is quasi-formal in that it is mostly targeted to school children in schools, the mobile service of the Museum during its visits to various parts of the country shows environmental educative films to the communities in the evenings. The museum publication called the Zebra's voice is biannually published as another means of disseminating environmental and cultural information to the

public. The publication is distributed to all primary schools in the country and to other relevant establishments. Museum displays are another way of disseminating information to the public and conscientizing people on environmental issues.

Conclusion

The need for environmental education is illustrated in the review of the main environmental problems highlighted in this paper. Population pressures, rising energy consumption, resource depletion, pollution and ecosystem degradation are all indicative of the need to alter our exploitative attitude towards the environment. The role and strength of non formal education lie in the fact that it does not operate within a given set of rules with a strict structure, curriculum and examination procedures. At least theoretically, non formal environmental education is more capable of responding to local environmental issues which have more social meaning and usefulness to the community and is less dominated by academic requirements. However, one of the major problems envisaged in the effective implementation of non formal environmental education is the diversity of the target groups and their needs. Other problems include the lack of finance and structure through which environmental concepts can be developed.

The role of the media in environmental education

T Mbuya
Editor, Mmegi

I have been asked to speak on the 'role of the media in environmental education'. In my attempt to address this issue I will give an assessment of our performance, presently, as the local media in disseminating news about the environment and then suggest what the local media could do to be more effective in their endeavour to inform the public about the environment.

Botswana, like other developing countries, has limited channels of communication. There are only seven newspapers in the whole country. All of them are based in Gaborone. Only one of them, the Daily News, enjoys a wide circulation and can reach the remotest of settlements in the countryside. The rest are 'town and big village' newspapers. Out of the five only one is bilingual. The rest use English only.

The situation is even worse in the electronic media. There is only one radio station. It can not be picked up in some parts of the country even though it is supposed to be the most accessible medium in the rural areas where the education need is greatest. Instead people there listen to foreign radio stations which are easier to pick up where they are. There is no local TV station. We watch CNN, Bop TV, M-Net and SABC. While these stations provide us with valuable information about what is happening in the international scene they are not relevant to our society's immediate needs at least in terms of environmental awareness.

CNN persistently tells us about dying animals in the Gulf seas as a result of this and that oil slick when our immediate concern here is the desert which is encroaching deeper into our rangelands. SABC bothers us about the pollution of water sources in the Witwatersrand by the mining industry there and says nothing about the thousands of Batswana starving as a result of the drought. And we listen to Bop TV praising President Lucas Mangope for killing donkeys in their homeland to curb overgrazing when here we are troubled by the uncontrollable large herd of elephants which are destroying our fragile ecosystem in the north-west.

The point that I am trying to make here is that the media in Botswana is so underdevel-

oped that we resort to foreign sources of information which have little or no relevance at all to our immediate needs. Even if there was a way to generate information about the environment locally there would still be the problem of how to get it down to the ordinary man in the street in the absence of such communication systems.

Given these limitations what is the local media doing to promote public awareness about the environment presently? Since I am a newspaper man I will confine myself to the print media. The common mistake that both media critics and readers in general make is to think that just because a particular newspaper does not have a page slung 'Environment' or 'Greens' at the top then it means our newspapers do no report on the environment. No. That is not true.

I do not want to get into the intricacies of defining the concept of 'environment'. I think there are people here who are more well disposed to do that than I am. However, I believe the phenomenon of environment touches on just about every aspect of human life. Mankind himself is but part of his own environment. Almost always there is an environmental angle to stories on health, industry, entertainment, agriculture, crime, etc. When addressing a Union of African Journalists (UAJ) conference in Cairo, Egypt, last year, UNEP's Executive Director, Dr Mustapha Tolba said: "For many Africans safeguarding the environment is a matter of sheer survival. In Sub Saharan Africa in particular people do not need to be told about the link between poverty and environmental degradation—they experience it day in and day out".

That notwithstanding it is true that our newspapers are far from doing enough by way of disseminating information on the environment. Without trying to justify this unfortunate state of affairs I must say there are various reasons why this is so. Firstly, many editors do not believe that an environmental story is a 'big' story. The newspaper industry, like any other business, is there to make profit. In order to make profit a newspaper should sell so that it can attract advertisers. Serious stories, as most environmental stories tend to be, do not sell a

newspaper easily. Of course the only exception, in Botswana, so far was the 'Dredging of the Okavango' saga. It was a serious environment story and it sold newspapers!

The second problem emanates from the fact that even when an effort is made to report on the environment, the message cannot reach many people because the newspapers are written in English. The people who should be the target of such information do not benefit from it because they do not know English. The mistake that our newspapers make is to write for the urban educated Motswana and then attempt to sell their product to a Motswana in the countryside. We are cheating ourselves. If indeed we are in the business of news reporting to inform the public then we should strive to reach out to the most disadvantaged of our people as much as we possibly can. The majority of these people are in the countryside and most of them can speak only one language—the local language. I am pleased to report that my own newspaper, *Mmegi*, devotes a full page exclusively to news on environment in Setswana once in every month. We wish others could do the same.

The third constraint is that those institutions in the country which deal directly with environment type issues keep away from the media. These include Government departments as well as non governmental organisations. Even though one of the qualities of a good reporter is to 'have a nose for news', surely we cannot sniff out everything even when it is hidden from us. The media needs the support of these organisations to be able to promote public awareness on environment. The media is the most effective channel to carry this important message across to those who need it. We could be used as a vehicle to impart environmental education to the public on behalf of these organisations at no cost to them!

Lastly, I believe it is fair to say that some environmental topics are complex and technical. Journalists lack training in tackling some environmental issues. They are not scientists or even historians for that matter. Reporters are communicators. They thrive on information which they get from sources who are in the know. One may be keen to write about a topic but due to his limited knowledge in that field fall to do a good job. It is in such cases that the cooperation of those conversant with these issues should be prepared to help. But how many times has a reporter been turned away by an 'expert'? Many times. The annoying thing is that the same 'expert' complains about 'the poor quality of our newspapers' when the article does not measure up to standard. Of course in some cases it is the reporter himself who was lazy not to do his homework. These are some of the

problems that local reporters are facing in their coverage of news on the environment.

The picture painted above may give the impression that the situation is a helpless one. The contrary is true. It is encouraging to note that editors of our newspapers are beginning to realise that the 'environment' is a big story. Environmental issues are gradually moving from the inside pages of the newspapers to the front page. This is the trend world wide. This is due to the growing interest that the public take in environmental issues. An international poll conducted in 16 countries for the United Nations Environment Programme (UNEP) last year revealed mounting concern for the global environment among a vast majority of people of developed and developing countries. The same applies to Botswana.

It would help if organisations could hold seminars and workshops to acquaint journalists with the latest environmental information. The local journalists association, BOJA, in conjunction with Panos, held a media workshop on the environment last June in Maun. It was an eye opener for the local journalists who attended it. Since that workshop there is a considerable improvement in coverage of the environment both in terms of space, prominence and quality of newsreporting. Of course it is not enough. But a firm foundation has been laid.

It emerged at the Maun workshop that there were certain issues that the local media considered to be priority environmental issues for Botswana. There was consensus that it is the local environmental concerns that needed to be given priority in our newspapers. The public should be taught about desertification, pollution, conservation, soil erosion, sanitation etc, things which they can see, feel and experience in their daily lives. Dr Mustapha Tolba expressed the same sentiment at the Cairo conference about what he considered to be pertinent environmental issues to Africans. He said: "Africans want to know about what is the best kind of tree to plant; which crops will best improve the fertility of soil; and how can firewood be burnt most efficiently". This may sound simplistic. But it is true. The point that he was making is that the media should be sensitive to the pressing needs of their communities.

By looking after their immediate environment Botswana could contribute to the protection of the global environment. As one participant succinctly put it at the Maun Conference: 'We should teach our people to act locally and think globally'. For instance if farmers in the countryside do not burn the bush they lessen the amount of carbon dioxide, which is a greenhouse gas, in the atmosphere. If members of a particular community in Botswana do not cut

down trees indiscriminately then they are helping to curb the expanding desert which is threatening to engulf the whole subcontinent of Southern Africa.

It is therefore important that before our newspapers can tell the public how chloro-fluorocarbons destroy the ozone layer, and how greenhouse gases cause global warming, which might sound too abstract and unreal to them, they should address the simple and easy to understand issues to which our communities can relate.

In this vein an effective way to get through to the audience is to concentrate on the 'human interest' angle in a story. People like reading about people and how they cope with problems. We should write about the success stories of farmers and women in the countryside in safeguarding the environment. In other words we should not be patronising, ie always trying to show them that they are not doing the right thing and this is how they should do it. Such experiences can inspire others that there is a great deal that Botswana can do for themselves to escape the downward spiral of environmental decline. As it does that the media should be careful not to project the people as the 'problem' the 'obstacle', and the 'threat' in environmental management.

Related to this is the use of easy to understand language. Media workers are communicators. For them to reach out to their audience and be effective they need to use 'down to earth language' which can be understood by young and old alike. If it can be helped language should not be a barrier in communication. Reporters should get into the habit of carefully selecting easy and familiar words instead of using superfluous and flowery jargon which

cannot help us reach our desired goal—that of informing in order to influence attitudes. If we use rhetorical language, no matter how good and well researched our articles can be, readers would be switched off. And if that happens then we would have failed as communicators in our duty to inform.

I would like to conclude my presentation with Tolba's words at the UAJ conference in Cairo last year referred to above. He said: "From the big political story to the human interest columns, no opportunity should be missed to communicate the gravity of the environmental crisis and, more to the point, what can be done about it".

Yes local journalists have the responsibility to keep the public fully informed about the state of their environment and to provide alternative models of development where it is feasible - thereby encouraging authorities to see the need for urgent action to safeguard the environment and its natural resources. This is the challenge before all media workers in Botswana—journalists, columnists and cartoonists alike.

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Guidelines for developing non-formal environmental education programmes

U Carlsson

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Yesterday, I finished my address by claiming that if we are to be able to live in a more environmental friendly way and to develop resources in a sustainable way, we must be environmentally literate. All of us must be environmental education literate from the decision makers to the workers and right down to the youngest part of the population. To be able to reach the whole of the population, we need a non-formal or out-of-school approach in addition to the formal curriculum.

We can quickly see that non-formal environmental education has certain very positive advantages over formal environmental education. For example, there are no given rules and the subjects are not framed by a strict curriculum. In addition, there is more flexibility to address local problems and to pick ones target group directly.

However, there are also problems and some of these strong points are potential weaknesses. For example, there is a diversity of target groups and a lack of structure. In addition, there is a lack of finance, it is not centrally organised and it is difficult to know which is the best media to use.

Broadly, non-formal environmental education can be divided into participatory and non-participatory. Participatory activities would include group discussions, drama/theatre, community participation in projects, wildlife clubs and nature schools. Non-participatory activities would include media, publications, press articles, exhibitions and lectures. Where pedagogical methods are used they should be the same as for formal education; methods such as active learning, holistic thinking and problem orientated teaching.

Let us look at some of these examples more closely and at some of the problems faced in each of them.

Community Participation Projects

No matter how you address a rural or urban community in a developing or a developed country, you have to study the target group first to understand their level of background knowledge. It is possible that they might not even be

interested in being addressed or they may not consider the environment something worth considering. Choosing your target group is very important. For example, women often make a responsive target group. Somebody said, if you educate a man you educate one person, but if you educate a woman you educate a whole family. Who ever you target, if you can reach a well defined target group that is willing to participate in a well organised project then a community participation project is probably the most effective form of non-formal environmental education.

Lectures and group discussions with adults can be problematical. These situations can seem very like a formal school classroom and many adults have bad experiences and memories of their own school time and will not feel comfortable in similar situations as adults.

Wildlife clubs are becoming very popular in many countries such as Kenya and Botswana. These organisations are an effective way to reach young people and to enable them to learn more actively about the environment. Through these clubs they can actively participate in conservation issues. Nature schools are an important addition to primary and secondary schools in Europe and in North America.

Although non-participatory, media such as television, radio and newspapers should be encouraged to disseminate information and to build an educated and informed public opinion. They have the advantage of regularity and can offer daily or weekly programmes on environmental issues. They can incorporate environmental issues into more general programmes and can make sure that the educational potential of some programmes is maximised. The immediate nature of the media means current and local environmental issues can be addressed and they can encourage audience participation.

I said that the educational potential of the programmes should be maximised. Let me give an example of how a multimedia approach can help to develop the non-formal educational potential of programmes. In Sweden, educational television programmes are backed up with written educational material. In Ghana, where

they have problems with bush fires, a song about bush fires which was initially introduced in primary schools became popular and started playing on the radio. The children recognised it, it became a family song and was even introduced on television so that children throughout Ghana could see that they were participating in a national event.

A costly project from Sweden shows what can be achieved on a nationwide basis with good central planning. A booklet called *The Natural Step* was distributed to all households in the country with an audio-tape. At the same time, schools were advised to introduce the ideas in the book and tape to the children in the hope that they would take the information home and endorse the message. The impact of such a project is hard to evaluate and I have not seen any results from research on this project. However, it is an interesting idea.

Still in Sweden, the Nature Conservation Society, one of the largest NGOs of Sweden has produced a best selling guide called *Green Consumer Guidelines*. It contains advice on recycling and on making environmentally friendly choices when shopping. Similar consumer guides exist in many developed countries where consumer choices can have great impact on which industrial products are successful.

The environmental message can be spread on everyday objects such as milk cartons and

telephone books. It just takes someone to make the approach to the manufacturers.

These are just a few examples. You only need ideas to start something.

Non-formal teachers

The teachers working in non-formal environmental education must be more innovative than the ordinary teacher. He or she cannot rely in proper classrooms to focus their students attention, nor can they expect classroom discipline. There may also be suspicion against the teachers and the subject to overcome. For these reasons, non-formal environmental education teachers must be properly educated themselves and their training should include the psychology group dynamics apart from a good grounding in environmental knowledge.

To evaluate non-formal environmental education to determine its efficiency is difficult, particularly to see if non-participatory methods have any effect on their audience. However, evaluation is an important part of all education and how it is to be done must be specifically designed into the project.

Finally, it is formal and non-formal working together which will create a public opinion beneficial to the development of sound environmental practises by decision makers and to a general public who carries out their own environmentally sound actions on a day to day basis.

Non formal education evaluation

M Monroe

North American Association for Environmental Education

Why evaluate?

One of the primary reasons that programmes are evaluated is to prove their worth and to use that information to obtain more funding. It is also done to improve a facility, a programme or staff performance.

Typically, evaluation takes the form of staff reflection. People involved with the project ask themselves and each other, "Did it work?" Or, they evaluate on the basis of numbers; the numbers of people, the numbers of programmes presented or very simply the numbers of brochures taken away.

With both of these avenues you know very little about the quality of the programme or whether the objectives of the programme were being met. In fact, it may give you information that has nothing to do with the programme you are presenting. For example, someone may have thought that your posters would make good door prizes, so they took 25 of them, or they may have been told that they would get funding if they came to your centre, or that they could only get transport for trips lasting less than one hour, so they had to come to your location.

Much more useful are meaningful numbers; ones which really relate to your programme and people's response to it. For example, the number of people who actually received brochures and the numbers of people who made repeat visits. In fact, it is possible to become very clever with evaluation just through some acute observations: which litter barrels are used most, which trails are most heavily used and where are the fingerprints on the glass of the exhibits.

The precise methods you use depend on why you are evaluating. It is important to know if the programme is expanding, if you are applying for more funds, so for this you would count the numbers of people attending. But to improve staff efforts, other methods are needed.

Staff evaluation can be very threatening since it raises all sorts of questions in people's minds such as, "What if it is not working" or identifies staff which should be replaced. So it is very important as you evaluate the quality of the programme that you involve staff in the process of developing the evaluation process. And that the purpose of the evaluation is to improve the programme.

Which people can help evaluate programme quality?

Everyone involved in the programme from the staff, the teachers to the students or target group can be involved in evaluating the programme. And what do you measure?

The objectives of the programme can be examined to see whether they have been achieved, but these should not be relied on too heavily. And definitely, evaluation should be built into the programme design. For example, in my programme on frogs and toads, I gave a test prior to the programme and one after the programme had been delivered. I also tested a control group who did not receive the programme. The interview technique can be used to provide a qualitative response but the questions need to be very carefully formulated. And will it be the students who have been the main target of the programme who will be tested or their teachers who arranged for the programme in the first place. Where the test takes the form of multiple choice answers be sure to avoid yes/no choices and instead ask people to rank answers on a 1 to 5 scale.

The subject of evaluation is a science in itself. This talk has provided a very brief overview, but if you take nothing else away from it, please remember that evaluation, however informal can be a valuable tool in improving your work.

The role of NGOs in non-formal environmental education

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Introduction

Environmental education is a relatively new phenomenon in Botswana. To date, NGOs with an interest in the environment have acted as catalysts and initiated non-formal environmental education programmes. These organisations include the Botswana Society, the Forestry Association of Botswana, the Kalahari Conservation Society, Thusano Lefatsheng, Wildlife Clubs of Botswana, and others.

Since the existing NGOs have their own fairly precise focuses, their involvement in environmental education has been similarly narrow. A matrix showing major environmental issues against existing NGOs (Table 1) reveals that there are key issues which are not addressed by any organisations. An analysis of the content of environmental education programmes conducted by NGOs also shows that they are generally preoccupied with the cognitive domain i.e. with information dissemination, and the affective is largely omitted. This is possibly a factor of the newness of some of these programmes, and should change in time as the programmes mature.

Better coordination is essential if NGOs are to improve their role in environmental education in the future. The joint development of an integrated programme with strong lateral linkages, and clearly defined priorities, are vital if NGOs are to continue to make a cost-effective contribution in this field.

Non government organisations

While this paper does not intend to dwell on individual NGOs and their merits or otherwise, it is necessary at the outset to introduce those which have played a significant role in environmental education to date.

The Botswana Society is one of the older NGOs in Botswana; it has as its objective, *inter alia*, the encouragement of interest in the fields of the natural sciences, especially where this relates to Botswana. The Botswana Bird Club, which is affiliated to the Botswana Society, is a specialised group dealing, as the name suggests, with birds, but as a component of a wider environment.

The Chobe Wildlife Trust has a full-time environmental education officer operating in the Chobe District, with the Chobe National Park as the focus of their activities. They have an education centre in Kasane, and a mobile unit which travels out in the district.

The Forestry Association of Botswana also has full-time environmental education staff, and concentrates its efforts on educating teachers and schoolchildren on the importance of trees and reforestation.

In addition to its own environmental education programme, aimed at decision-makers, the Kalahari Conservation Society has also supported other initiatives such as Botswana's environmental education programme and the Association of Wildlife Clubs of Botswana, aimed at primary and secondary school children and teachers respectively.

Thusano Lefatsheng is primarily a rural development agency concerned with the commercialisation of indigenous plants; however its extension programme, which concentrates on sustainable use of the resource, addresses aspects of environmental education.

The Association of Wildlife Clubs of Botswana has recently registered as an independent NGO, although it has its origin in the Department of Wildlife and National Parks over a decade ago. The key features of the Association's environmental education programme is that it aims to involve the youth in practical, hands-on conservation projects.

Almost all the existing NGOs are young organisations, which have only really embarked on environmental education programmes in the last three or four years. In addition, there are also a few new NGOs which will be contributing to this field in the future; these include Conservation International, IUCN Botswana, Natural Resources Conservation Society, Tshomarelo, Okavango Conservation Trust and the Tull Lion Trust. Other NGOs such as the Botswana Council of Women and the Young Women's Christian Association, also have a greater contribution to make in this field in the future.

The scope of environmental education programmes

The National Conservation Strategy identified and to an extent prioritised major environmental issues in Botswana, and this forms the basis for an analysis of the scope of existing environmental education programmes. The main environmental issues are pressure on water resources, degradation of rangelands, depletion of wood resources, over-use of veld products, and urban and industrial pollution. In addition, subsidiary issues identified during the Strategy formulation include human population pressure, depletion of wildlife and public awareness (the latter has been excluded from the analysis since all non-formal environmental education programmes conducted by NGOs are addressing this aspect).

The matrix below illustrates at a glance that there are crucial environmental issues which are not addressed by any of the existing NGOs. For example, pressure on water resources, rangeland degradation and the overpopulation issues currently do not receive much attention. By contrast, the depletion of wildlife is an issue which is addressed by more than one NGO.

Although not specifically illustrated in the matrix, it is important to note that the man-made environment is virtually totally excluded from all existing environmental education programmes. This exercise can be taken further to include specific target audiences; when this is done, other significant gaps become apparent. For example, decision-makers in central and local government form a significant target

group, but do not have this importance accorded them by most education programmes.

Educational content of programmes

In addition to the above, it is the contention of this paper that most non-formal environmental education programmes conducted by NGOs do not strike an effective balance between the Psychomotor, Cognitive and Affective Domains. Before qualifying this statement, it may be appropriate to explain these terms in simple language:

- Psychomotor—doing/action
- Cognitive—knowing
- Affective—understanding

Bloom's hierarchy describing the relationship between these domains, although reductionist in approach, did receive a great deal of support during its time. However it is generally accepted today that a good educational programme should contain elements of each, as is illustrated below. In my opinion, there are very few non-formal environmental education programmes currently in existence which have been consciously structured to include these crucial components. For example, some of the existing programmes are media oriented, and focus on knowledge (cognitive); knowledge alone does not necessarily lead to action, which is usually the stated goal of environmental education programmes. Few existing programmes provide fora for discussion although this is a method which leads to better understanding of issues

Table 1 shows the spectrum of issues addressed by existing environmental NGOs

Environmental issues	NGOs						
	AWCB	BBS	BS	CWT	FAB	KCS	TL
Pressure on water resources	•						
Rangeland degradation	•	•					
Deforestation	•		•	•			
Veld product exploitation	•					•	
Pollution	•						
Over-population							
Depletion of wildlife	•	•	•	•	•		

BBC/Botswana Bird Club; BS/Botswana Society; CWT/Chobe Wildlife Trust; FAB/Forestry Association; KCS/Kalahari Conservation Society; TL/Thusano Lefatsheng; WCAB/Wildlife Clubs Association of Botswana

and which in turn has a greater chance of leading to action. Even fewer combine these with hands on experience and involvement. To illustrate in a positive way this shortcoming of environmental education programmes conducted by NGOs, the Wildlife Clubs provide a useful model: they combine knowing, feeling and doing in a workable combination. They produce newsletters, organise lectures and film shows, have workshop discussions, and undertake field excursions to national parks. In addition, they undertake hands-on projects such as tree planting, anti-litter campaigns, and others, all of which together produce citizens with the correct knowledge, values and attitudes which lead to environmental action. It is interesting to note that it is difficult in the classroom situation to include a balance between doing, feeling and knowing; this emphasises the importance of environmental education, and especially of NGOs, in complementing the formal education system with its current emphasis on "chalk and talk". For this reason, it is all the more important for NGOs to review the educational content of their programmes, and ensure that they address the Psychomotor, Cognitive and Affective Domains.

The Road Ahead

For NGOs to continue to make an important contribution to environmental education in Botswana, they will need to rethink their roles

in the light of the above-mentioned findings.

Greater coordination between NGOs is essential if they are to continue to make a cost-effective contribution to environmental education. Coordination should focus on the scope of programmes, relative to major environmental issues, and target audiences. Priorities should be established jointly. The Environmental Liaison Group could be a useful forum for coordination; however currently it does not include all the environmental NGOs.

Finally, if NGOs wish to remain at the forefront of environmental education in Botswana, they will need to critically evaluate the educational content of their current programmes. To the best of my knowledge, none of the environmental education programmes conducted by NGOs has ever been objectively evaluated despite the fact that critical review is the basis for continuing improvement. These two aspects will be addressed in other workshop sessions during this conference.

Conclusion

NGOs have played a leading role in non-formal environmental education to date. However this is no reason for complacency; there is room for improvement, and I hope that this critical analysis of their programmes will be taken in a positive light and encourage them to continue with their vital work.

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Annex 4

Abbreviations

BCA	Botswana College of Agriculture	SADC	Southern African Development Community
BRIDEC	Brigades Development Centre	UB	University of Botswana
CTO	Central Transport Office	UN	United Nations
FAB	Forestry Association of Botswana	UNEP	United Nations Environment Programme
IUCN	International Union for the Conservation of Nature and Natural Resources	UNESCO	United Nations Educational Scientific and Cultural Organisation
KCS	Kalahari Conservation Society	USAID	United States Agency for International Development
NCS	National Conservation Strategy	USIS	United States Information
NDP	National Development Plan	WCED	World Commission on Environment and Development
NGO	Non governmental organisation	WWF	World Wide Fund for Nature
PESC	Pre-entry Science		
SIDA	Swedish International Development Agency		