

# **Present Status and Future Possibilities for infusion of biodiversity Conservation Issues into School and College Curricula in India**

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## **Abstract**

The status of biodiversity education in current curricula has not been sufficiently addressed. The Bharati Vidyapeeth Institute of Environment Education and Research (BVIEER), Pune, is involved with studying the current status of biodiversity education in school and college level through three major studies:

- 1) 'Education and Awareness aspects of Biodiversity and its Conservation'. Setting Biodiversity Conservation Priorities for India, Biodiversity Conservation Prioritisation Project (BCPP), funded by USAID, 2000.
- 2) 'Status of Environmental Infusion in School Curricula and the Effectiveness of its Delivery, India Environment Management Capacity Building project of the Ministry of Environment and Forests, funded by the World Bank, 2002.
- 3) A committee set up by the University Grants Commission (UGC) to create a common core module syllabus for graduate students in all faculties as a compulsory paper. This has been followed by developing a textbook and a CD-ROM for the course in response to the Supreme Court's order to implement a course in environment at the college level in 2004.

The paper analyses the status of school textbooks from all the Indian states; the teaching technology used by teachers to impart Environment Education (EE) in relation to biodiversity conservation, and documents the current UGC initiative to develop a common core curriculum to be used for all undergraduate students in the University system. It provides an analysis of data and future possibilities both at the school and college level, to enhance biodiversity awareness through formal education.

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The paper focuses attention on the current status of formal and non-formal EE strategies in India. It analyses school textbooks and makes recommendations for changes in forthcoming years, and identifies the barriers to making classroom EE teaching more effective. It brings home the need for the use of materials other than the textbook for teaching/learning about the environment and the need for further training and capacity building for teachers. At the college level it has provided documentation of the UGC' s current initiative.

The paper will also lay stress on the professional and postgraduate studies that require inputs on biodiversity conservation issues. Initiatives for the future must be based on the following findings at the school, undergraduate and postgraduate level:

- Initiatives at the school level

A variety of differences exist in the textbooks currently in use in the different states. There is an existing component on the environment in nearly every textbook, which however, needs enhancement. Information on biodiversity conservation is essentially non-existent. Current information on environmental concerns does not translate to enhanced awareness, concern and action. The most serious issue is how the textbook information should be reoriented so as to create pro-conservation 'action links'. New textbooks would have to be written in a way that achieves this goal, so that a strong ethic for the conservation of biodiversity is developed through standard textbooks. Biodiversity cannot be learned without the use of good visuals. The inclusion of visual aids is therefore necessary.

While current textbooks suggest various activities, there is very little stress on the need for field trips—the most powerful learning tool in EE. Teacher training, both pre- and in-service, has been a major source of concern.

- *Initiatives at the graduate level*

The problem that must be addressed at the graduate level is the need to implement a common curriculum for all faculties, and strengthen biodiversity conservation components in the B.Sc. and M.Sc. courses in Botany, Zoology and Microbiology.

At the college level the UGC has now developed a common curriculum for all undergraduate courses and has assigned the task of developing a textbook for the common paper on environment. Biodiversity and its conservation is a substantial input in the core module course curriculum of the UGC.

- *Initiatives at the postgraduate and professional level*

There is a need to identify the strengths and weaknesses of the different courses available across the country. It is equally important to assess the pattern of jobs these students are involved in after their graduation.

Several initiatives need to be taken at the National Council of Educational Research and Training (NCERT), State Council of Educational Research and Training (SCERT) s and teacher education levels to implement the findings of the above studies.

## 1. Introduction

In a grassy opening near a Sacred Grove in the Western Ghats, I found a strange well-laid out configuration of wild cucurbits, sticks, leaves and a tiny structure surrounded by pebbles. I asked the local pujari of the sacred grove what this meant, thinking that it had a ritualistic significance. His reluctance to answer made me all the more curious. “Nothing, nothing”, he kept repeating. Finally as he was persuaded to tell me what it was, he called a small cowherd sitting nearby and asked him to explain. The boy said that this was his farmyard. The cucurbits were buffaloes, the sticks was the fence and the structure his cowshed. He had to collect all the appropriate materials from his own surroundings to put his game together. An incredible way to learn from nature. Compare this to the sterile plastic toys purchased by an urban child from a store without any understanding of resources.



In India, learning from nature is a tradition in most cultures in which people base their lives directly on natural resources. Modern school and college education in India tends to in fact negate learning from the students own surroundings. While there have been efforts to use non-formal learning tools in some special schools, this is not brought into standard methods of teaching in the formal Educational sector.

Biodiversity is increasingly considered a key resource at global, national and local levels for the sustained wellbeing of humanity. With a growing awareness that it is the raw material on which our future biotechnological development, agricultural produce and pharmaceutical industries will depend, its economic potential now appears to be greater than any other natural resource. Added to this are its other values such as those that are linked with the livelihoods of people who

depend on it directly, the tribal folk, traditional agropastoralists, fisher folk and a host of other diverse communities. As the wilderness shrinks, the refuge of its denizens that contribute to the great diversity of wild species, their unquantifiable genes, and the complex ecosystems they live in, threatens the biological heritage that we have inherited on earth and should pass on to our future generations. Biodiversity is mainly sequestered into a small proportion of land and water on the surface of the earth, that we have set aside as National Parks or Wildlife Sanctuaries. These biodiversity rich areas are increasingly fragmented and are being gradually isolated from each other. The threat to biodiversity is an ongoing phenomenon that is closely linked to the development processes that induce changes in land and resource use. One would expect that this great economic resource and one that is being rapidly lost, should generate a deep concern in people. However, if one looks at the Indian scenario, one finds that efforts to create an awareness for supporting biodiversity conservation has reached a very small segment of society. While it is true that communities who are directly linked to using wilderness resources, intimately know and appreciate the value of the biological resources around them, this deals invariably with either species they use in their day to day lives, those they fear, or those they venerate. Species that they do not use, or those that do not form a part of their daily lives, are essentially ignored and invariably may not even have local names. Further our modern educational processes have created a major 'gap' in knowledge of the value, threats and conservation needs of biological diversity. The nature of this lack of awareness has rarely been assessed and documented. This inevitably has led to an inability to fill this gap through formal education.

While NGOs such as the Bombay Natural History Society (BNHS), over the last 125 years and WWF-I from 1969, and a host of other organisations and Government agencies in India have tried to generate an awareness of the value of biodiversity, they have been unable to create a critical mass of individuals who could strongly lobby for biodiversity conservation. What then is the prime cause of the failure of our conservation NGOs and NGIs to bring about a mass conservation awareness movement? A green movement can only succeed in creating pro conservation policies if it has been able to work through a strong lobby force based on a significant proportion of human society. If this critical proportion of the population is not reached, there can be no strong desire on the part of elected representatives in Government to implement conservation action.

It is evident that the NGO sector, which constitutes good models for creating conservation awareness cannot be expected to reach every member of human society in India through an organised and homogenous strategy. Thus conservation consciousness in a society which consists of diverse stakeholders requires a totally different approach. If a large proportion of human society have to be addressed through a common conservation education and awareness initiative, the most effective tool is undoubtedly school and college education. Our experience at BVIEER both in rural and urban schools shows that information on environmental conservation rapidly percolates into the students' families and disseminates into local community thinking. Thus perhaps the most important tool for enhancing conservation awareness has remained essentially untapped in India. It has the potential to reach a large segment of India's population through an existing well-organised sector, which is essentially aimed at education and is responsible for the evolution of attitudes and behavioural changes in the country.

College students are the opinion makers of tomorrow's society. They are also receptive to new ideas and are able to act for conservation if their concern is kindled. A study of undergraduate and postgraduate curricula even in subjects connected to biodiversity such as biology and zoology shows that the value of biodiversity and the need for its conservation have been inadequately dealt with.

Formal professional education in conservation has few takers as there are very few job opportunities. This has to be reversed. If jobs are created, young people committed to the cause would undoubtedly gravitate towards these professional courses on conservation.

Education awareness and training for biodiversity will need not only a whole new approach but also a substantial increase in funding. The outcome and benefits however would far outweigh the costs, as the value of biological diversity is indeed priceless.

Interestingly the new wave for infusing EE into curricular processes in schools and colleges in India has been triggered by the Supreme Court in response to MC Mehta's Public Interest Litigation. However, responses to this though positive, have been slow. It is as if Government wishes to appease the Court by putting out statements that it has responded to the Supreme Court's orders by instructing organisations such as the NCERT and SCERTs to introduce EE in schools and the UGC in colleges. While some information on biodiversity has begun to appear in textbooks, it is still poorly dealt with. Most of the 'gaps' in information are related to ecosystem studies and the species diversity and richness of our country. Biodiversity, especially in relation to the mega diversity status of India and the urgent need to conserve it, is conspicuous by its absence in school curricula and textbooks. At the college level the courses have not been altered to bring about a concern for biodiversity conservation. Issues such as the loss of biodiversity and extinction of species are rarely included in the curriculum at undergraduate or postgraduate levels. A major gap is concepts related to sustainable development. Most importantly formal curricular processes have not been aimed at creating pro-conservation behaviour.

## **2. Current Status of Conservation Education and Awareness**

The Bharati Vidyapeeth Institute of Environment Education and Research (BVIEER), Pune has been involved with studying the current status of biodiversity in school and college level through three major studies:

1. 'Educational and Awareness aspects of Biodiversity and its Conservation'. Setting Biodiversity Conservation Priorities for India, Biodiversity Conservation Prioritisation Project (BCPP), funded by USAID, 2000
2. Study of the Status of Environmental Infusion in School Curricula and the Effectiveness of its Delivery, India Environment Management Capacity Building Project of the Ministry of Environment and Forests, funded by the World Bank in 2002.
3. A Committee set up by the UGC to create a common core module syllabus for Undergraduate students in all faculties as a compulsory paper. This has been followed by developing a textbook and a CD-ROM for the course. The work has been done as a response to the Supreme Court's orders to implement a course in Environment at College level in 2004.

These studies have not only assessed the status of information on biodiversity in the country, but have provided guidelines and recommendations to enhance the knowledge of biodiversity through educational processes

Learning processes that lead to enhanced information on conservation at the school level arise out of a combination of formal and non-formal educational processes. The latter however are rarely used and are accessed through NGO initiatives, books that are not a part of the curriculum, magazines, newspapers and television programs. Thus this does not reach a majority of the students, as it is essentially an optional extra curricular form of learning.

### **2.1 Current status of Non Formal conservation awareness strategies**

Current strategies that have evolved to further 'Nature Education' have used non-formal environment education processes such as nature clubs, treks and camps. These have been started by NGOs such as the BNHS and WWF-I and other NGOs. BNHS has been using field visits to natural history sites for its Members for the last several decades. Salim Ali's first paid job with the BNHS was as a Nature Education Officer in the early 1920s. However, the intensity of these activities has been driven by the level of funds available which has been too limited to reach large numbers of people.

WWF-I has developed the largest network of essentially urban school students, in its Nature Clubs of India program, in the world. During the 1970s and 80s, a large number of local NGOs also began conservation awareness programs in several urban centers.

Newsprint, magazines, and television programs added to this type of non-formal information. These initiatives have also been essentially targeted at the urban sector and have not even attempted to use strategies that would be appropriate for people from rural and wilderness areas.

### **2.2 Current Status of Formal conservation education strategies**

The education and awareness aspects for the Biodiversity Conservation Prioritisation Project (2000), studied at the Bharati Vidyapeeth Institute of Environment Education and Research, Pune, assessed the formal educational inputs related to biodiversity for school and college students. The knowledge base of concepts on biodiversity conservation and how it was learned was studied in various sectors of society. It stressed on the wide differences in perception of biodiversity in urban, rural and tribal cultures. The project undertook 22 studies in different sectors of society and documented what different communities knew about biodiversity and how they learn about different aspects of biological diversity.

## **3. Educational and Awareness Aspects of Biodiversity and its Conservation**

The 22 studies have demonstrated the great diversity in knowledge of biodiversity in different communities and education related concerns. It also demonstrates that each sector in our heterogeneous communities have different 'gaps' in their awareness of biodiversity issues.

**The 22 focal studies on Biodiversity Education and Awareness include:**

1. Biodiversity in school curricula
2. Biodiversity information in the teacher community
3. Analysis of biodiversity information among school students
4. Information on biodiversity in school children from different communities
5. Efficacy of non-formal conservation education in enhancing biodiversity information
6. Comparison between urban and rural school students of perceptions on biodiversity issues that indicate the level of awareness in the study group
7. Study of environment education for enhancing concern levels
8. Environment education for action generation aspects
9. Possible ‘trigger’ sources for biodiversity conservation action
10. Analysis of syllabi at college and university level
11. Analysis of biodiversity information and awareness levels among college students from the Science, Commerce and Arts faculties
12. Level of information on biodiversity that could lead to enhancement in awareness in different communities
13. Sources of information on biodiversity in an urban society
14. Assessment of indicators of information levels on biodiversity in media, parliamentary questions and concerned sectors of Government and NGOs
15. Analysis of awareness on biodiversity issues in different target groups
16. Analysis of ‘trigger’ mechanisms among highly aware individuals
17. Gaps in implementation
18. Examples of actions initiated through non-formal environment education
19. Case study on the Uttarkhand Seva Nidhi environment education program
20. A study of traditional perceptions that have led to conservation action of biodiversity through sacred groves
21. Information available in print material for analysis and reporting on biodiversity conservation for education and awareness aspects
22. Local perceptions on biodiversity and gaps in knowledge

**3.1 Cultural differences**

A few of the many interesting aspects that emerged from the BCPP experience are of relevance to appreciate both the status and future possibilities to enhance conservation consciousness. It was found that tribal cultures know a great number of local plant and animal species. In fact their knowledge of species is several times greater than the knowledge of species that graduate and even postgraduate students of Botany and Zoology learn about. Tribal people knew and had names for a large variety of local species. They knew how to use wild plants. They were aware of which species were dangerous. Several species were considered sacred. Species in these three categories invariably had local names. The classification of these species into groups was different from modern taxonomic classifications. However, this was ideally suited to their purpose. Several ‘gaps’ in their information from traditional sources were identified. For instance, species that they did not use, were not life threatening, or had no religious significance, frequently did not have specific names. They were invariably clumped into vague groups of animals or plants with no specific names. Widely different species of insects for instance had

only a single name. Many species of birds had no local names. Plants that were not used for a specific purpose had no specific names and were classified simply as 'wild' plants.

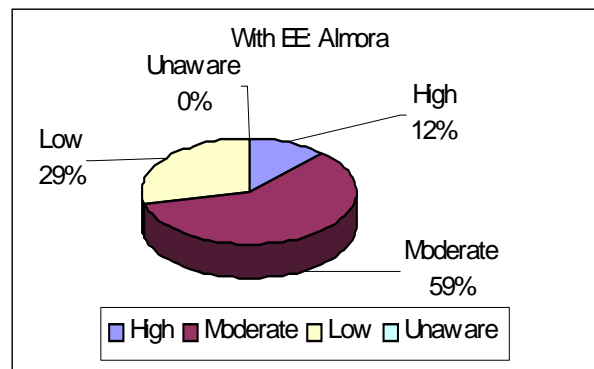
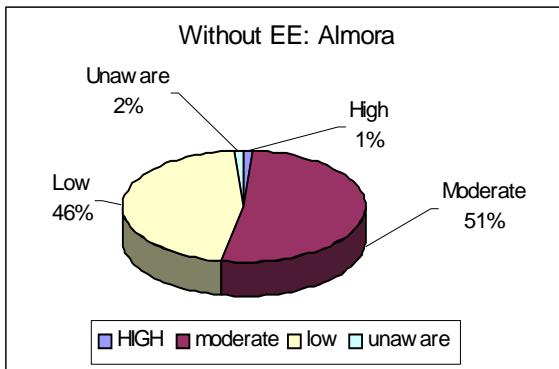
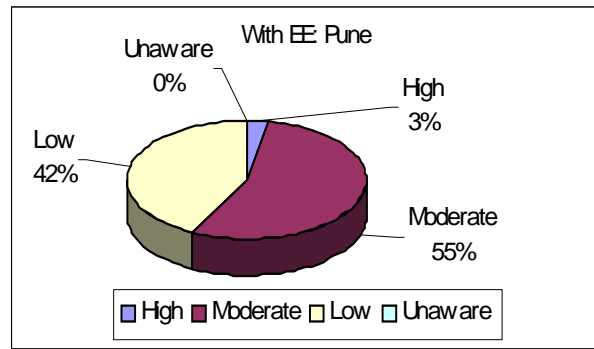
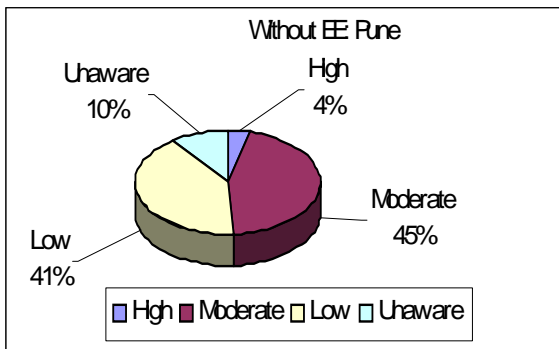
We found that agricultural communities who lived outside the forests did not have the intimate knowledge of species or their habitats, that the hunter-gatherer had a deep insight into. Tribal people knew many more medicinal plants than adjacent agriculturalists who in turn knew more species than urban people living in the same ecological region.

### **3.2 School students and conservation awareness initiatives**

A comparison between school students who were given an extra curricular environment education (EE) program and those where no such programs existed in the same area, showed the level of incremental knowledge of biodiversity that can be initiated through non formal approaches. The program in Almora was conducted by the Uttarakhand Seva Nidhi and the Pune program by Bharati Vidyapeeth Institute of Environment Education and Research.

**Comparison of levels of information on biodiversity in Students without an EE program and with an EE program**

Level of knowledge	HIGH		MODERATE		LOW		UNAWARE	
	No.	%	No.	%	No.	%	No.	%
<b>Without EE</b>								
Almora (n=200)	2	1	104	52	91	45.5	3	1.5
Pune (n=100)	4	4	45	45	41	41	10	10
<b>With EE</b>								
Almora (n=200)	24	12	119	59.5	57	28.5	0	0
Pune (n=66)	2	3.03	36	54.55	28	42.43	0	0



The Biodiversity Conservation Prioritisation Project studies have convincingly demonstrated that the non-formal EE strategy by creating conservation awareness through the NGO sector, was relevant only for a small sector of society. It cannot be expected to lead to a mass conservation awareness movement in Indian society. While the NGO initiatives across the country form an excellent set of models, they have been able to address only a very small proportion of people.

#### **4. Study of The Status of Environmental Infusion in School Curricula and the Effectiveness of its Delivery**

There have been few studies on the present status of environment and conservation related issues in the formal processes of education. A recent initiative has been done through Bharati Vidyapeeth Institute of Environment Education and Research in Pune.

This project was funded by the World Bank, through the India Environment Management Capacity Building Project (IEMCB), of the Ministry of Environment and Forests, Government of India in 2002. The extensive study was implemented by the Bharati Vidyapeeth Institute of Environment Education and Research, Pune and covered various aspects such as a Content Analysis of school textbooks for environmental issues which included natural resources and biodiversity as well as how teachers implemented teaching on environment related concerns in schools from 8 States in India.

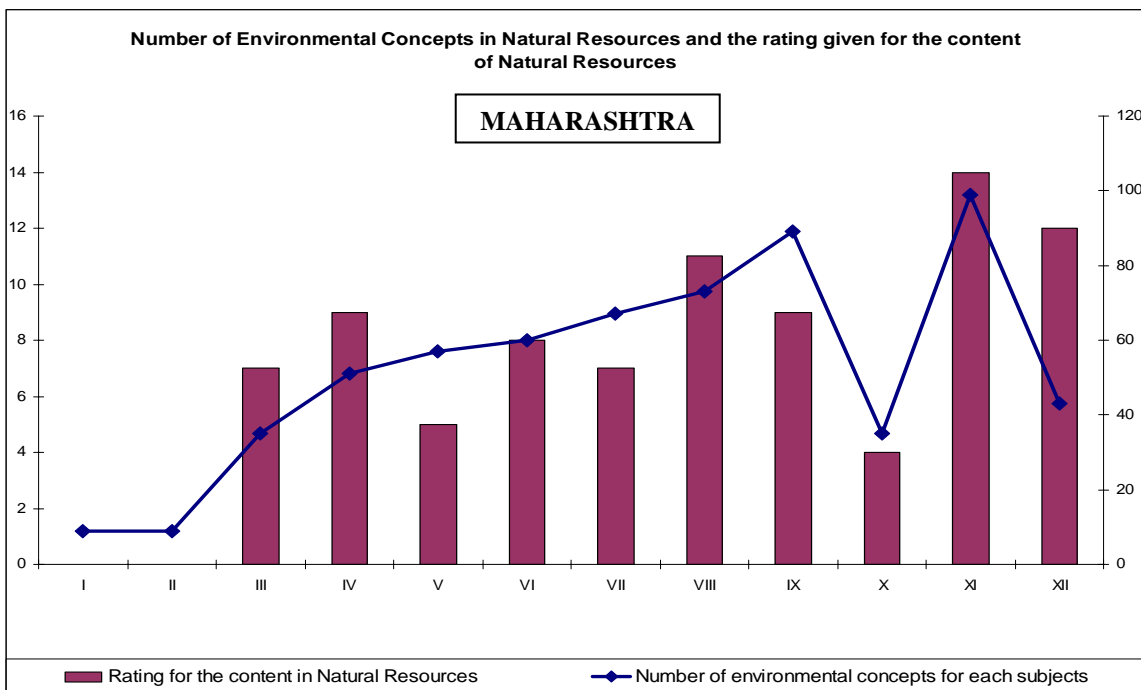
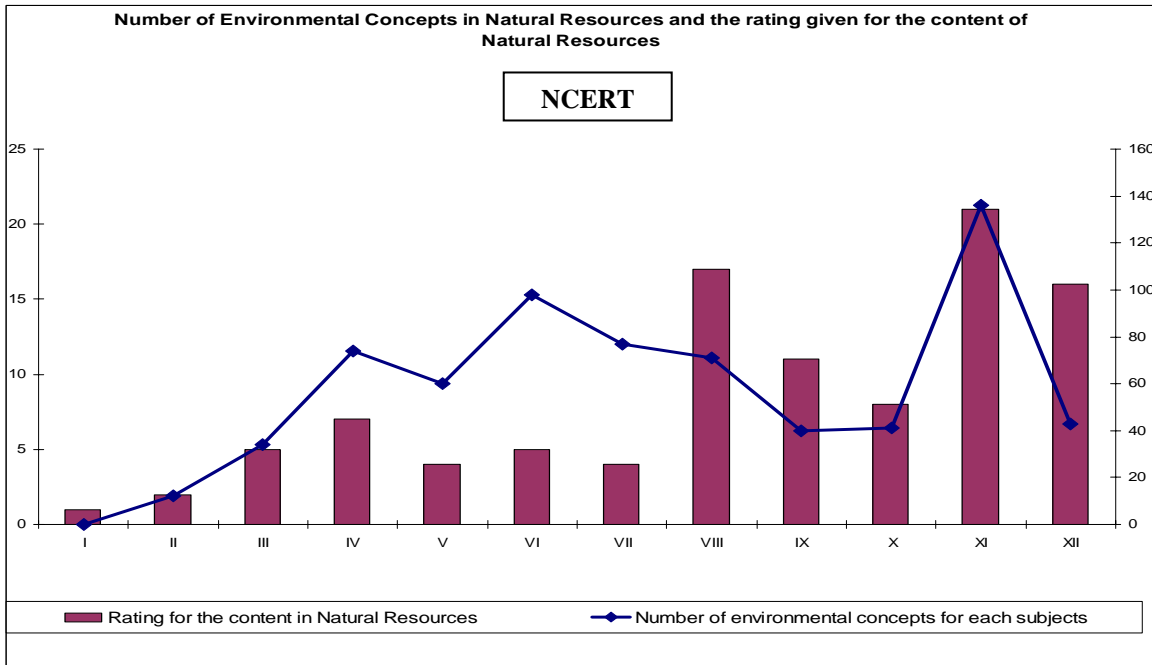
The Status of environment education at school level has become an increasing concern after the Honourable Supreme Court instructed the Government to introduce environment education at the school and college level. At the school level, the NCERT has thus begun introducing environment through an infusion approach of a few environmental concepts in the textbooks. In 2004, the NCERT has also held a participatory workshop with a large group of experts to develop a curriculum for a separate subject on environment.

A] The environmental content analysis of textbooks by BVIEER covered 1849 school textbooks of Science, Geography, Social Studies and Languages from Standard I to XII for all the 32 States in India, both in the English and the vernacular medium. Environmental concepts were coded and analysed through a customised Java based program into 98 specific concepts. These were grouped into Natural Resources, Biodiversity, Pollution, Energy and issues related to People and Environment. The computer program was able to develop a roadmap of where and how these concepts were addressed in different subjects in each Standard through the 12-year school program of each State. This map of concepts on environment clearly demonstrated the 'gaps' in information that should be filled. The qualitative analysis revealed the level of awareness generated and whether it could lead to a concern for the environment and a willingness to act at the student level.

B] The BVIEER team visited 10 States in India to assess how teachers were implementing EE in different types of urban and rural schools, identified if specific environment related activities were encouraged and compared the differences in teaching between teachers who had taken an additional non-formal course in EE with those who had no exposure.

## STUDY – A: Textbook analysis from different States (All subjects)

### Example: NCERT and Maharashtra

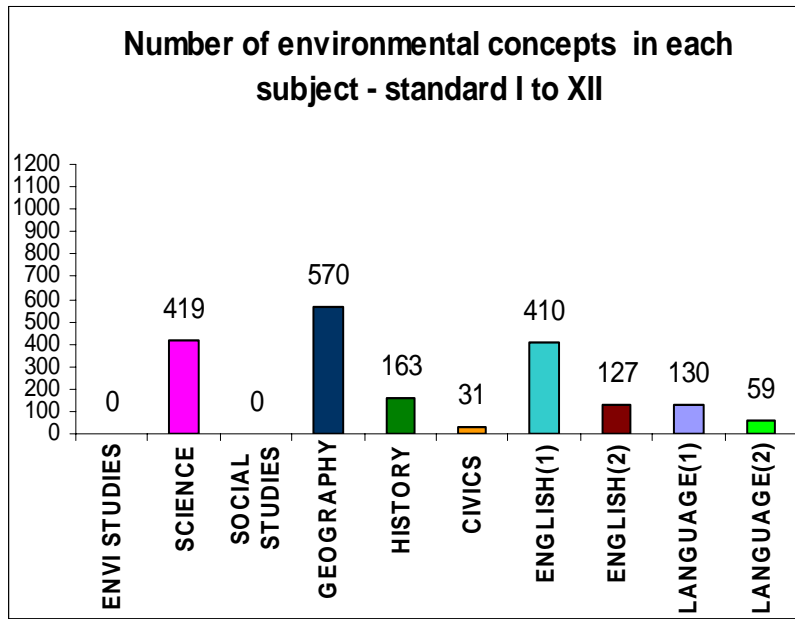


**Note:** The number of concepts and their level of knowledge does not show a steady rise. Environmental concepts are inadequately provided in textbooks of Std X to XII, which

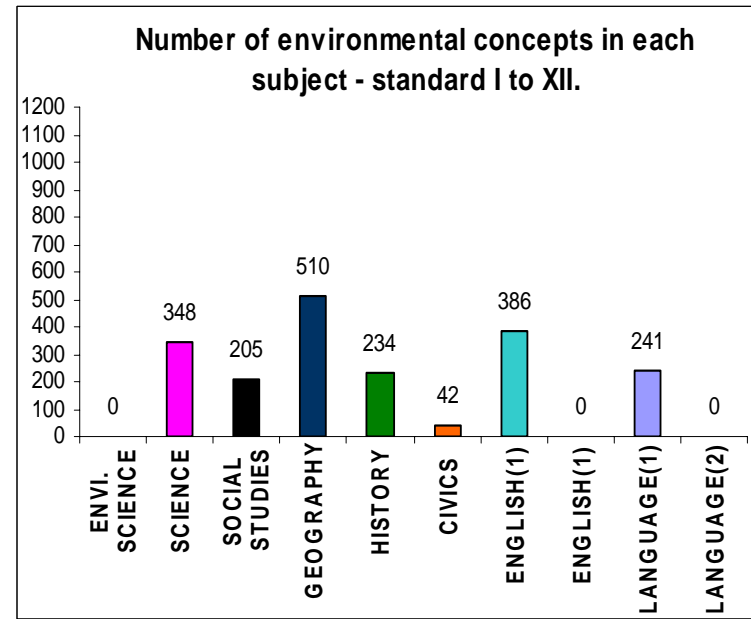
are Board exams and hence taken seriously by students. The number of concepts is not necessarily related to the level of information in textbooks.

## STUDY – A: Textbook analysis from different States

**Example: Number of environmental concepts in each subject - Standard I to XII in NCERT and Maharashtra**



**MAHARASHTRA**

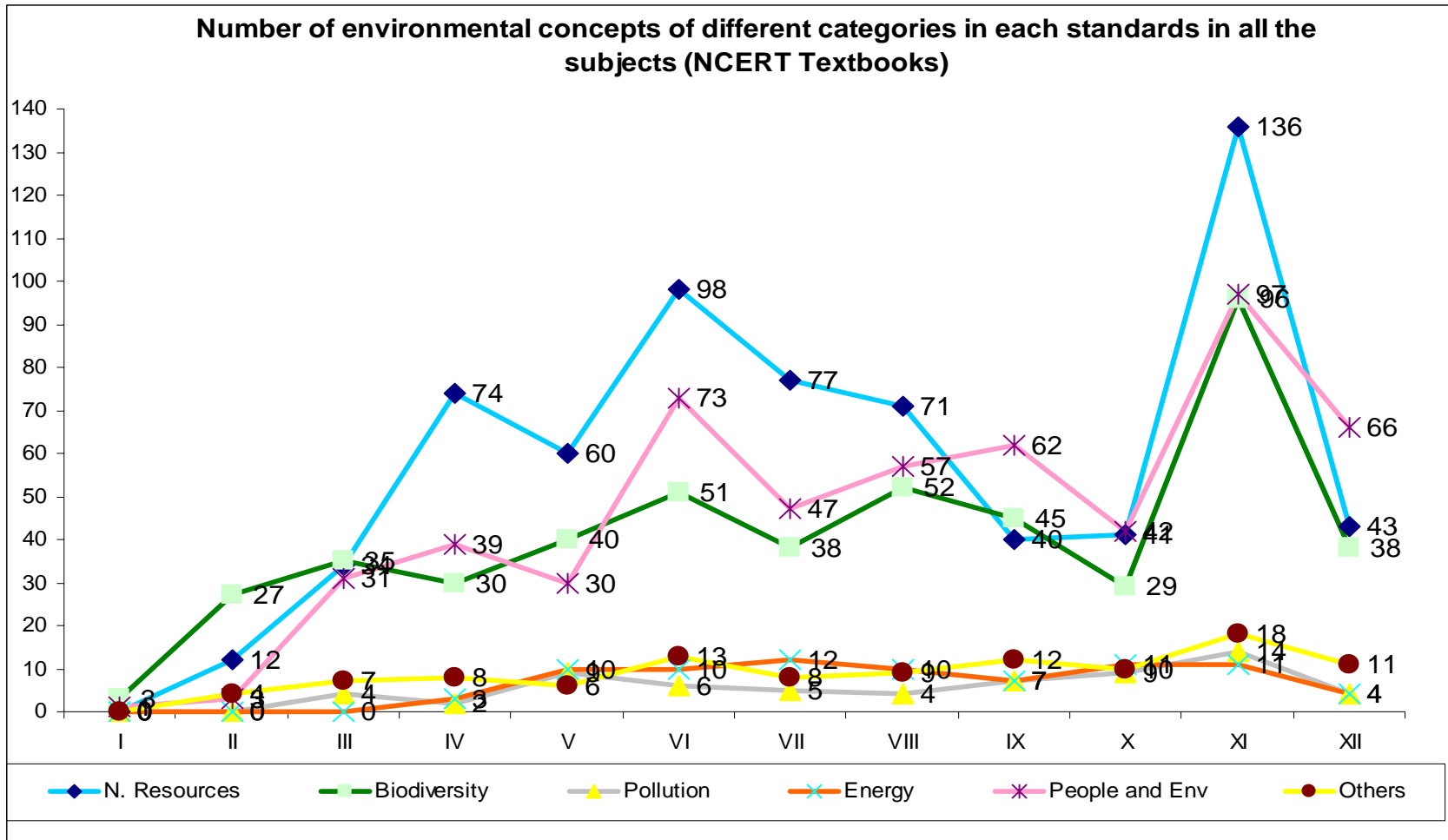


**NCERT**

**Note:** Geography has a large number of concepts followed by Science. There are very poor environmental concepts provided in Civics, which could ensure behavioural change. There is a great variation in environmental concepts provided by different State textbooks.

## STUDY – A: Textbook Analysis of different environmental concepts

Example: NCERT



**Note:** The breakup sector wise shows the relative importance given in textbooks.

The study on Content Analysis of textbooks showed that there were statements on environmental issues that include biodiversity scattered through the textbooks but these have not been able to link the educational process towards producing pro environmental action. For a child to grow into a pro-environment action oriented individual who changes his/her own behaviour towards a more sustainable lifestyle, requires a process that goes through,

*Information* → *Awareness* → *Concern* → *Action*

Currently, school textbooks do not do this. Teachers who have grown up through the same educational system cannot be expected to bring about these concepts without specialised training. Most teachers had a very limited worldview of the environment. A majority stated that environment is primarily concerned with environmental pollution and tree planting! This very limited view of environment, that does not consciously include issues such as water and soil conservation, traffic and industry as a cause of air pollution, urban sewage and industrial effluent as a cause of the death of rivers, the need for equitable distribution of natural resources and the vital need to preserve our biological heritage in our ecosystems, species and genetic estate, are not included in their perception of the word ‘environment’. Thus they cannot transfer this concern through the formal education process to their students. Their inability to utilize techniques that strongly enhanced environmental awareness such as field visits to nature education sites and trips to environmental problem areas situated in their own surroundings, as ‘learnings’ on environment, is a serious deterrent to the environmental education process. Changing the learning processes by using these tools could bring about an environmentally conscious society by involving the enormous number of school students in India. Our experience at Bharati Vidyapeeth Institute of Environmental Education and Research in over 165 schools in Western Maharashtra, both in the rural and urban sectors, has shown that a conservation education program clearly linked to the formal school education curriculum, rapidly reaches the family and the community.

#### **4.1 Content Analysis of school textbooks – the gaps**

The study identified the ‘gaps’ in information related to conservation of biodiversity in current textbooks used in schools throughout India.

- Ecosystems, especially those related to local landscapes is a serious ‘gap’ in knowledge provided in science and geography textbooks.
- A food chain is represented most frequently as being rat-snake-eagle. This is repeated in several standards and thus other food chains seen by the student through his own life experience are not made overt. It leaves a student unaware of the great diversity of food chains in nature.
- The selection of species in textbooks has global species rather than stress on the great diversity of Indian species. Students are taught about species such as giraffe and armadillo but not sambar or chital. They are expected to learn about esoteric organisms that can be only seen under a microscope which does not exist in the school, but not the common insects, birds, amphibia, reptiles, fish and mammal species they are likely to see around them. There was very little emphasis in textbooks on endangered or endemic species found in India. Students who have done a Bachelor’s degree in Zoology have learnt from school onwards what a mosquito larva and pupa looks like in a textbook diagram, but cannot identify them in a pond

when alive and wriggling! Most students cannot identify by simple names more than a dozen birds out of the 1250 bird species seen in India! Students do not know the difference between a leopard and a cheetah. Or that the cheetah is already extinct in India! Their knowledge of plants is extremely poor. These are some of the many examples that were identified that were related to the lack of information provided by textbooks.

- Information in textbooks does not increase in complexity from Standard I to XII by gradually enhancing environment and conservation information over the years. Information related to biodiversity is scattered and uncoordinated through the curriculum. A fairly complex concept may occur in the Std V Science textbook, but is given in a simpler treatment in Std VII in the Geography textbook.
- ‘Gaps’ identified on conservation issues are related to ecosystems, and their different types, food chains, food webs, energy pyramids, ecosystem degradation, sustainable development, extinction, endemism, conservation of wild species of plants and animals, issues related to ecosystem conservation, effects of pollution, resource use issues related to biodiversity, are some of the serious gaps that have been identified. There is no information of the local biological diversity of the State. Information on the biogeographic regions of India and its States is lacking. Common and endangered species of India are essentially missing from textbooks of most States. How ecosystems can be sustainably used or how degraded ecosystems can be restored has not been introduced in textbooks. India’s megadiversity status, the threats to endangered species and contemporary conservation issues are not brought into current textbooks of Science, Geography or Languages.
- Examples of flora and fauna are of a very general nature. The tree species described in the component on natural vegetation focuses only on species of commercial importance. Common and endangered animals of India rarely find a place in the textbooks.
- Although names of National Parks and Sanctuaries have been mentioned (though most often only once or twice during the course of 12 years) they are not State specific, nor do they bring home the linkage between Protected Areas and biodiversity conservation.





## 4.2 Recommendations for changes in textbooks

- The design of new textbooks must be based on a clear understanding of the lacunae in existing textbooks identified in this study rather than reinventing the wheel and creating a totally new set of ‘gaps’ and/or replicating the other problems that have been identified through the study for each State.
- The disparity between the primary and secondary school textbooks, in terms of the environmental orientation of the content, activities, quality of visuals needs to be addressed, as both concepts and visuals are more frequently encountered only at the primary level and are poorly dealt with in higher classes.
- Visuals related to plant and animal species are relatively few and poorly executed.
- The important environmental concepts need to appear more frequently through a gradual up gradation process throughout the course of the twelve years of school curricula. Issues related to ecosystems and biodiversity need to be dealt with comprehensively in future textbooks.
- The X and XII standard textbooks must include a much greater level of information on all components related to the environment, as the number of concepts in current textbooks is low in these important years when there are board exams.
- Key environmental assets and problems of each State need to be identified to ensure that an adequate amount of locale specific environmental issues are brought into the relevant lessons in the textbooks of Science, Geography, Civics and Languages.
- Teacher Handbooks are frequently inadequate, or if developed are not available, or do not reach the teacher.
- Locale specific additional material on the environment is not available. This must be developed at least for States following the NCERT textbooks.
- Along with infusion, a separate space and time focused on environment education has now been allotted in several States. However, teachers do not know how to utilise this time for infusing environmental concerns. This requires additional material and teacher training.
- For Environmental Studies which is a stand alone class to be held once a week, there should be a complete re-orientation in the writing style of textbooks as well as teacher support material. It should contain both the biological and social content that the class on ‘environment’ should cover. Issues such as sustainable development and an awareness of local environmental assets and problems must be discussed in this session. Activities suggested in the textbooks should include visits to Protected Areas, or at least local nature study sites outside the town or village.
- Textbook Committees for rewriting environmentalised textbooks of Science, Geography, Civics, etc. should include content experts, who are well-versed with environmental studies, to assess the accuracy of environmental concepts. Current subject experts used for writing textbooks are not necessarily competent in this regard. The committee must have a mix of both.
- A participatory exercise for visualization what is expected from a textbook must form a basis for ‘environmentalising’ textbooks. This must include environmental experts, conservation scientists, school teachers as well as the textbook writers.

- Interactions between textbook writers of the same and different subjects will ensure that there is a gradual increase in information base across standards, as well as within a particular standard for different subjects. There is a need for science, geography and language textbook writers to interact before subject textbooks are drafted, and develop a team along with environmental experts and conservation scientists.
- The potential of language textbooks to deal with the ethical, moral and aesthetic aspects of conservation of biodiversity needs to be explored and introduced at the appropriate level after being taught in science and geography.
- The separate subject discussed by the NCERT based on the Supreme Court's orders needs to be implemented along with adequate in-service and pre-service training.

### **4.3 Current Status of Teaching Environment Education in Schools**

This study sampled schools in 10 states and Union territories in the country. The States surveyed were Andaman and Nicobar Islands, Assam, Goa, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, and Uttar Pradesh.

The study is based on Questionnaires, Semi-structured interviews, Group discussions, Workshop sessions with teachers at the BVIEER, and discussions with Content Analysers of textbooks and environment educators with experience of working with teachers.

#### **4.3.1 Findings:**

- Teachers generally have a very limited worldview of the scope of environment education. If they have not been trained in a special conservation education workshop, their perception of issues related to biodiversity is grossly inadequate.
- Methods used for imparting environment education are mainly through EVS as a separate subject in the primary classes.
- In the secondary classes it occurs only through teachers interested in imparting environment education, or if triggered by interested school management.
- Teachers as well as students are unaware of the environmental assets as well as the local environmental problems of their own States, regions or local environmental issues.
- Teachers are unaware of the large quantity of relevant extra curricular environment education materials available in the country.
- Their exposure to biodiversity conservation is limited to newspaper articles.
- They have not been exposed to techniques related to nature education or field related activities.

#### **4.3.2 Barriers to making classroom EE more effective, as stated by teachers included:**

- Lack of time
- Environment Education is not a separate subject and thus is not given adequate attention.
- Lack of EE materials and aids

- Lack of training in using alternative tools for EE such as audio-visual aids and visits to ‘nature awareness areas’.
- Inadequate management support from school principals, Education Officers, etc.

#### ***4.3.3 Use of materials other than textbooks to teach and learn about environment:***

- A small proportion of teachers said they use material from newspapers, magazines, National Geographic magazines, encyclopedias, or television to teach environmental concepts (mainly in English medium schools).
- A very small percentage of highly motivated teachers reach out to NGOs to acquire environment and conservation related educational material.
- Use of resource persons for enhancing conservation awareness has been occasionally utilized by a few schools.
- Competitions, environment fairs or Nature orientation through field visits is rarely if ever used as a learning experience.
- Resource Centers such as CEE Ahmedabad, or its branches; CPR-EEC Madras; UKSN, Almora; RNNHM-Bhopal; BVIEER- Pune; BNHS-Bombay; have been used very rarely as resource agencies.

#### ***4.3.4 Training and capacity building:***

- The teacher training workshops on environment that have been attended by a small proportion of teachers have had a major focus on enhancing their knowledge base, rather than on developing skills and have not included motivating the teacher to conduct environment and conservation education activities in their class work. Most workshops did not include a session specifically on biodiversity. Field training and nature orientation was not a major component in Government sponsored workshops such as conducted in the DIET programs. They also did not orient teachers to field biology and nature study.
- Where EVS is a separate subject the State Department conducts one training program per year in some States. In states where EVS is not a subject this is mainly done through interested NGOs.

### **4.4 Recommendations for enhancing capacity building for generating conservation awareness:**

This includes enhancing pre and in-service teacher training, creating an effective NGO support system, and an effective means of disseminating additional information on biodiversity conservation.

#### ***4.4.1 Teacher Training:***

- Pre-service teacher education has not focused attention sufficiently on EE as a core theme. Training should focus not only on enhancing their knowledge base, but developing skills and sensitizing teachers to biodiversity conservation issues. This should include a major component of interpreting Nature through fieldwork.

- In-service teachers should be accessed through multiple training workshops rather than a single one-time brief exposure.
- Formal training courses in EE specially targeted at in-service teachers need to be developed. These must include special sessions on biological diversity.
- Introducing EE into DIET programs is an essential aspect.
- Refresher Courses on environment and biodiversity conservation need to be introduced for school teachers.

#### ***4.4.2 The NGO Support System:***

- The NGO sector in each State needs to be networked into a strong support force to back formal environment education.
- Successful models like those of BNHS, WWF, CEE, UKSN, BVIEER, Eklavya, etc. may be replicated wherever possible.

#### ***4.4.3 Material development and dissemination:***

- Locale specific material related to curricula, which is user friendly and simple is a great felt need of the teacher community.
- Issues on biodiversity which are not included in formal textbooks need to be strengthened through additional material. Gaps identified include ecosystem studies for which BVIEER has developed a Teacher Training Handbook and Workbooks for students for the WWF.

#### ***4.4.4 Interpretation Centers in Protected Areas and Nature Awareness Areas in Taluka Places:***

Interpretation Centers are an important tool in generating public awareness of the need for biodiversity conservation. Each Protected Area should have a locale specific interpretive facility that is aimed at both tourists and local people. A 'Nature Awareness Area' should be developed in every Taluka Places, which caters to the conservation awareness building needs at the local level. These interpretive facilities must be linked to school and college education so that experiencing a wilderness becomes a part of the formal educational processes.

### **5. Undergraduate College Education**

Several interesting observations emerged during the BCPP study on Education and awareness for biodiversity, related to college educational processes. It was discovered that a larger proportion of Arts and Commerce students at the undergraduate level were better informed on issues connected with biodiversity conservation than Science students. When this was analysed through subsequent questions filled by college students in the questionnaires from different faculties, we found that this was because more Arts and Commerce students were watching Discovery Channel, while Science graduate students were kept busy in their labs and curricular work! The science curriculum did not give the

same opportunities to students while Arts and Commerce graduates had the time to see educational programs such as Discovery channel. This also shows the strength of the television for disseminating nature awareness if used appropriately.

In the formal Biological Sciences, there were several clearly identifiable gaps.

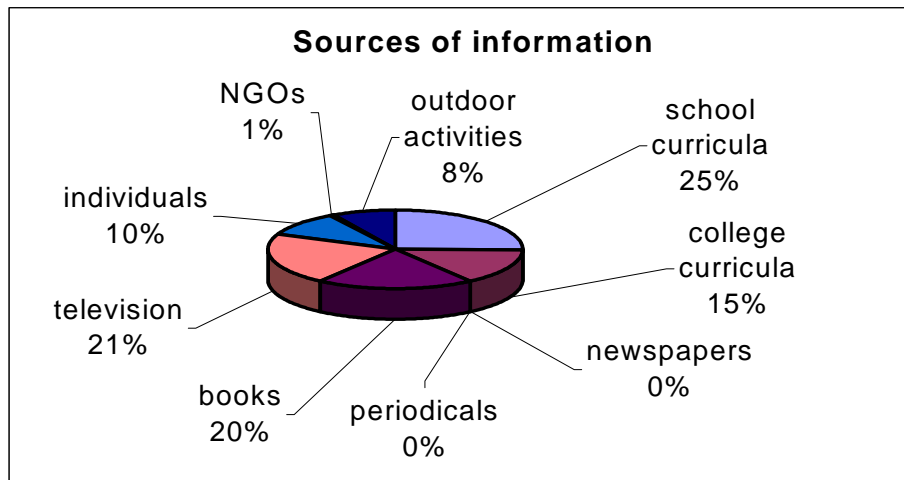
- Botany and Zoology programs do not have strong components on conserving species and ecosystems.
- Botany students still collect endangered species for making routine herbaria sheets. This creates a negative attitude to conserving species.
- No experiments are done on pollution in relevant subjects such as Chemistry or Physics in the field, which could point to species loss due to human activities.
- There is no attempt to use Nature Study or field experience beyond making collections in existing biology classes.
- Biodiversity conservation – at genetic, species and ecosystem levels, threats and methods of conservation, are still rudimentary in their treatment in graduate studies in Botany and Zoology.
- The currently developed common Core Module Curriculum designed by the UGC has yet to be implemented. There has been no thinking or initiative on how teachers will be trained to take this course.

### **5.1 Analysis of biodiversity related information in College Students**

Semi structured interviews were used to assess the factors that triggered an interest in biodiversity among urban college students. It was found that most of them rated school, extra curricular books and television as important sources of information. While college students identified school as being an important source of information, the questions asked showed that their level of information on biodiversity was extremely low. Thus the school curriculum did not appear to have been an effective tool in enhancing information on biodiversity.

*Sources of information on biodiversity rated by College Students*

SOURCE	School curricula	College curricula	News papers	Periodicals	Books	TV	Individuals	NGOs	Others /Outdoor activities
No.	38	22	0	0	30	32	15	1	12
%	25.33	14.67	0	0	20	21.33	10	0.67	8

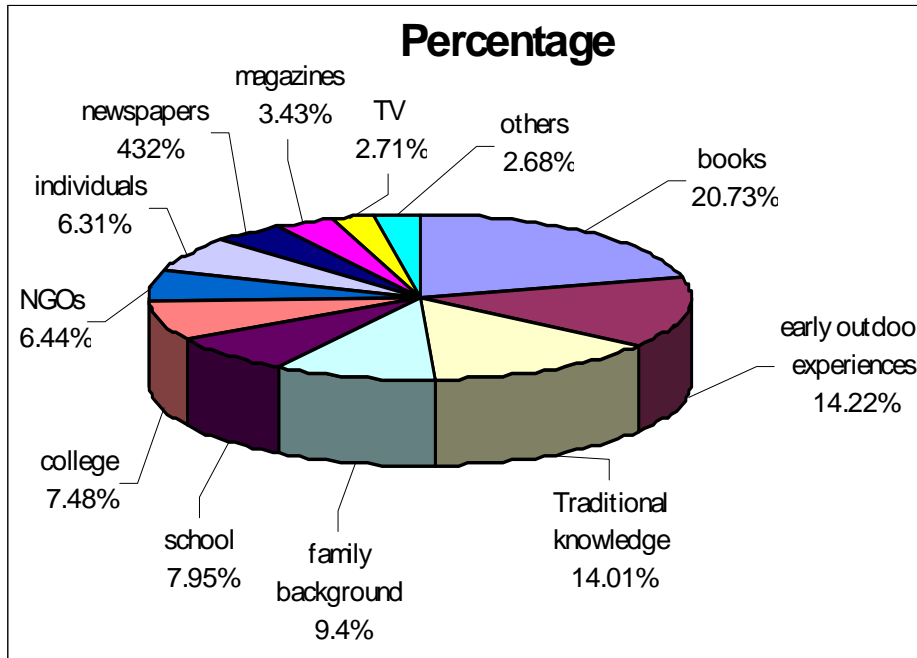


**5.2 Analysis of triggers in Green individuals:**

One of our most significant findings was to identify how people who were keenly interested in nature and had as a result, joined conservation NGOs, had acquired this interest. BNHS and WWF-I Members, were asked to fill a proforma and identify what had triggered their interest in Natural History. This showed a completely different set of ‘triggers’ that had led to conservation awareness, from that identified by most average school and college students, who had no special interest in conservation. Among the BNHS and WWF members, a vast majority (20%) said it was a result of reading extra curricular books. There were 14% who said it was through early childhood experiences with nature. Only 7% said it was through their school education and another 7% said it was through college educational process.

*Initiating factors of highly motivated individuals (n=244)*

	Books	Outdoor	Traditional Knowledge	Family	School	College	NGOs	Individuals	News Paper	Magazine	TV	Others
%	20.73	14.22	14.01	9.4	7.95	7.48	6.44	6.31	4.32	3.43	2.71	2.68



This comparison between average urban college student and those urban individuals who are highly motivated and informed of issues related to biodiversity conservation, strongly demonstrates two important aspects. The first that an early exposure to nature's wonders has a strong correlation with individuals who become environmentally conscious in later life. The second, that school and college education does not bring about a strong concern for conservation. It is a great missed opportunity. Nature education has thus reached a very small sector of mainly urban individuals from elitist schools.

If one expects a green movement to elect green representatives to Government, it would essentially be possible only if a significant proportion of the electorate wishes to vote for a green party with a green manifesto. If the majority of society feels the need for good ecologically appropriate governance, then politicians will emerge who begin to respond to this demand. Until this critical mass of individuals with pro conservation interests is

triggered into action, biodiversity and wildlife conservation cannot become an important part of policy making.

### **5.3 The UGC's initiative at the Graduate level**

The University Grants Commission's initiative for introducing environment (which includes biodiversity conservation) into college level as a response to the Supreme Court's order has been to set up a Committee which has now drawn up a Core Curriculum that will form the basis for a common paper for all faculties at the Bachelor's level. The Committee's recommendations include the need for a textbook and training of teachers.

## **6. Professional and Postgraduate Education**

Postgraduate studies in Botany, Zoology, Microbiology, etc. related to biodiversity conservation *per se* have not been sufficiently stressed in professional training courses. However, some MSc and PhD programs include issues related to biodiversity. Institutions in which the MSc curriculum has included a strong component on biodiversity are those which are related to wildlife biology and ecology. These courses are run by various institutions and are affiliated to different Universities. The Wildlife Institute of India (WII) has an MSc program linked to Rajkot University. The Bombay Natural History Society (BNHS) had an MSc program by research recognized by Bombay University for several decades. Bombay University recognized some of the BNHS scientists as guides. Rajkot University specialises in Ornithology, Alligar Muslim University on Wildlife Biology, Salim Ali School of Ecology stresses on field studies on a variety of biodiversity concerns. The Indian Institute of Science, Bangalore through the Center for Ecological Studies focuses attention on a variety of biodiversity related studies and research work. The BVIEER, Pune has a major initiative in its BSc, MSc and PhD programs on biodiversity conservation issues. It utilises a variety of learning tools including a CD-ROM on 'The Biodiversity of India', by EK Bharucha, published by Mapin.

These different courses produce a varied output of students with different strengths and weaknesses. Their job opportunities are limited to a few research or teaching institutions with a very limited number being absorbed into the Forest Department, which is responsible for Biodiversity Conservation. Research and training jobs need to be created within the Forest Department Wildlife Wings to absorb these highly trained postgraduates to strengthen biodiversity conservation.

## **7. Filling 'Gaps' in Formal Curricular Processes at School and College Level**

A set of questions needs to be addressed so that students can improve their knowledge, skills and attitudes to biodiversity conservation:

- What are the natural resources on which our lives depend?
- How are they used and by whom?
- How are they being misused or overused and by whom?

- How can these resources be preserved in the long-term?
- Students must be made aware of the incredibly high place of India among the world's nations based on its biological resources and heritage.
- What are India's common species and ecosystems, as related to their own subjects?
- What are our rare, endemic and threatened species of plants and animals?
- What do people need to know if we have to bring about a development paradigm that will support the conservation of ecosystems, species and genetic estate?
- How do we develop a stake in protecting nature in society as a whole?
- What is the role of the individual in supporting biodiversity conservation?

## **8. Conclusions**

The current status of infusion of biodiversity conservation related issues at school, college and postgraduate levels that can lead to biodiversity conservation is far from adequate.

### **8.1 Initiatives at the School level**

A variety of differences exist in currently used textbooks from the different States. There is an existing component on environment in nearly every textbook, which however needs enhancement. Information on biodiversity conservation is essentially non-existent. Current information on environmental concerns does not translate from information to enhanced awareness, concern and action. The most serious issue is how the textbook information should be reoriented so as to lead to creating pro-conservation 'action links'. New textbooks would have to be written in such a way that this is brought about and a strong ethic for conservation of biodiversity is developed through standard textbooks. Biodiversity cannot be learned without the use of good visuals. Textbook pictures of animals and plants were consistently poorly depicted in books from most States.

While the current textbooks suggested various activities, there was very little stress on the need for teachers to take students into the field to observe nature, which acts as the most powerful learning tool on biodiversity.

Teacher training both pre and in service has been a major source of concern.

### **8.2 Initiatives at the Graduate level**

The problem at the Graduate level that must be addressed includes the need to implement a common curriculum for all faculties and strengthen biodiversity conservation components in the BSc and MSc courses in Botany, Zoology and Microbiology.

At the college level the UGC has now developed a common curriculum for all undergraduate courses and has assigned the task of developing a Textbook for the common paper on environment to the BVIEER. Biodiversity and its conservation is a substantial input in the core module course curriculum of the UGC.

### **8.3 Initiatives at the Postgraduate and Professional level**

There is a need to identify the strengths and weaknesses of the different courses available across the country. It is equally important to assess the pattern of jobs these students are involved in after their graduation.