

**Workshop Number: 11**

**Workshop Name: Education towards Sustainability Concerns of Natural Resources in 'Fragile Ecosystems'.**

**Workshop Partner: International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal**

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**Workshop Dates:** 25, 26, 27/11/07 (Sunday, Monday and Tuesday)

### **Purpose and Context of the Workshop:**

Fragile ecosystems are important for their unique features and resources. These include mountains, deserts, semi-arid lands, wetlands and coastal areas. Many of the protected areas and islands can also be considered as fragile, and their concerns are important. Fragility is defined as the '*vulnerability of the ecosystems to external stresses either natural or man-made*'. Many ecosystems are at a critical level of degradation. These are prone to irreversible damage due to anthropogenic pressures and stresses beyond their recouping abilities. Human beings are an inseparable part of all ecosystems – they act both as the sustainer and the destroyer. All the ecosystems that render invaluable services are exposed to various threats today.

Increasing population, changing lifestyles and unplanned/poorly planned development are putting these systems on the verge of natural resource degradation. The frequency of droughts is increasing because of degrading environmental conditions. Intensive agriculture of unsuitable and exotic/cash crops and mining have lowered the ground water table, degraded or have led to the loss of grazing areas and wetlands. Various development activities – urbanization, rural energy and water needs among others – are major environmental concerns. Of particular concern are mega-dams promoted by most of the countries to address energy needs. These mega-dams threaten ecological

stability and the livelihoods of the poor and marginalized. Such mega-projects should be strongly discouraged and alternatives explored.

Many communities inhabiting these areas have a rich culture of indigenous knowledge, practices, skills and technologies that have evolved for generations. Despite these areas being the repositories of natural wealth, people are marginalized and poor in many fragile ecosystems. Soil erosion and increasing population pressure is causing a shortage of agricultural lands. Basic infrastructure in many instances is inadequate to provide education, health and other necessary facilities.

These unjust conditions are in sharp contrast to the basic rights emphasized or supported by international treaties and conventions for indigenous peoples and local communities.

The workshop participants, therefore, feel the following question to be central to the issue:

**How can communities living in fragile ecosystems, given the increasing societal pressures, continue to conserve and sustainably use their environment under their cultural conditions?**

The need to address the sustainability concerns of these fragile ecosystems through education was expressed in Agenda 21, Chapter 12 (for deserts and desertification) and Chapter 13 (for mountains). The United Nations Conference on Environment and Development in 1992 emphasized upon raising public awareness and ensuring adequate political, institutional and financial commitment for concrete action towards implementation of sustainable development.

In view of the existing and potential impacts of globalization and climate change on fragile ecosystems, these issues need to be included in education for sustainable development (ESD). This would encompass the scientific, social, economic, cultural and environmental dimensions (drivers, pressures, state, impacts and responses) which are what ESD is all about.

This workshop has envisaged looking at the progress achieved through environmental education over the years. The workshop takes forward the review of ESD in today's and future contexts in the light of global concern on climate change and its impact on the ecosystems. It is to focus upon defining the ways for sustainable utilization of natural resources by creating mass awareness through education towards a sustainable use of resources. This can be achieved effectively by strategically evolving a layout for future education based on existing experiences of success and failures to safeguard the fragile ecosystems in the different parts of the world.

A basic principle of education is that the learner should be enabled to do 'something' with it. In other words, environmental education not translated into action means nothing.

A solid knowledge of the environment and of the social structure and relations within the communities themselves, well documented, is the basis for effective methodologies for non-formal education.

## **Main Issues Addressed:**

The workshop was planned with the objectives of

- Addressing the sustainability concerns of fragile ecosystems through environmental education
- Sharing EE initiatives towards sustainable use of Natural Resources from different parts of the world
- Sharing sustainable technologies in use for Natural Resource Management through case studies
- Reviewing existing policies and initiatives
- Planning Education and Communication strategies to address different target groups
- Evolving a roadmap for ESD for the decade
- Developing networks and partnerships

The issue of the 'Impact of Climate Change on Fragile Ecosystem' was highlighted in the session's keynote address. Another keynote address tackled the issues of 'Managing Fragile Ecosystems with particular emphasis on Sustainable Mountain Development'.

The working group proceeded as panel discussions on three major themes based on the workshop objectives:

- Sustainability Concerns in Fragile Mountain Ecosystems
- Potential Adaptive Strategies for Sustainable Natural Resource Management and Livelihoods in response to environmental change.
- Knowledge management and dissemination strategies

Although some of the expected outcomes were decided during the preparation for this conference and this working session in particular, discussions were flexible and not rigidly focused on those pre-determined outcome points alone. This has led to a free and fare discussions amongst the participants.

## **Report on substance of workshop:**

Day 1 (25.11.07)

### **Keynote Addresses:**

Prof V K Gaur of the Indian Institute of Astrophysics, Bangalore delivered the first keynote address on 'Impact of Climate Change on Fragile Ecosystems'. Through different types of projection maps and mathematical models Prof Gaur provided an overview of the historical trends and potential effects of climate change on the larger scale of geological time. Effect of climate change in terms of alarming 'sea level rise' and Himalayan glaciers melting and resultant shifts in precipitation can result in floods, drought and other disasters. With the example of Greenland, he explained the effect of melting of ice on the ocean currents and subsequent changes in the Environment.

Some of the major conclusions made by Prof. Gaur are:

- 1) Knowledge-powered communities can best effect enlightened action – the knowledge of the time-space landscape of mountain system resources, values, environmental processes, societal vulnerabilities and risks through widely available user-friendly knowledge products, and creative educational programs

and information systems. We must therefore work towards state-of-the-art and research and development towards more reliable knowledge.

- 2) A strong policy commitment will generate the productive blend of traditional approaches (intuitive and experiential knowledge) and creative technologies designed with potential for spontaneous absorption.
- 3) It is important to ensure commensurate economic returns to mountain communities based on real value and benefits from mountain system endowments.

Prof. P S Ramakrishnan of School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, gave the other keynote speech on the topic 'Managing Fragile Ecosystem with sustainability concerns of mountain ecosystem'. He qualified that all the ecosystems today are under threat and hence the word 'fragile' can be applied to many other ecosystems. The issue is how people will adapt or are willing to adapt to the changes. Climate change forms part of the scenario, according to Prof Ramakrishnan, and we must look at the possibilities and how we can cope with the possibilities. He mentioned about the Bonn dialogue bringing global change issues and fostering dialogue between scientists and the media to bring what is happening before a wider audience. He urged that rather than look the factors individually, to look at all of them, and particularly the impact of global warming on food security.

According to him climate change will have threefold impact -  
One, developing countries will be much more impacted by the changes.  
Two, the more vulnerable sectors of the society, the poor, will be suffering more. In case of India about 77% of the population is extremely vulnerable.  
Three, the environmental change caused by climate change will be manifold; as environmental uncertainties increase, we will need to prioritise what we have to address.

Prof Ramakrishnan pointed out that biodiversity is the mechanism communities have always turned for their ways to cope. Many of the tribes of North East India worship and in turn conserve 'keystone species' of particular ecosystems. To cope with the effects of climate change he urged a return to some of the traditional ecological knowledge and the need to focus on 'hybrid technologies,' technologies that are a hybrid between modern technology and traditional knowledge. He emphasized the need for change in the mindsets of the scientists. While putting few guidelines for the Forest Department, for example, he urged for a multidisciplinary approach incorporating silvicultural, ecological, and socioeconomic aspects into the management practices. He spoke of his initiative in Ladakh on the communities' ways of preserving and restoring the natural landscape.

Like the other keynote speaker, Prof. Gaur, Prof. Ramakrishnan underscored the importance of knowledge products written in simple and easy to understand ways. He raised some provocative questions such as: 1) None of the universities at present in this region of mountains are playing a role on underscoring the importance of mountain development, perhaps a mountain development curriculum. 2) How many scientists are working on CBNRM? He urged a change in mindsets, starting from scientists to make their studies relevant enough to create a critical mass of people to change mindsets and prepare for the effects of climate change and highlight the role of mountains in it.

## **Panel Presentations:**

### **Theme – 1: SUSTAINABILITY CONCERNS IN FRAGILE MOUNTAIN ECOSYSTEMS**

#### **Chair: Prof G. Kadekodi**

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#### **Rapporteur:**

#### **Mr. Dharmaraj N Patil**

CEE, India

#### **Presentation – 1: ‘Environment and Environmental Education in Afghanistan’.**

By Prof. Nesar Kohestani, Director Environment Conservation Center for Afghanistan (ECFA), Department of Forestry and Natural Resources, Afghanistan

Prof. Kohestani began his presentation by point out ecologically important sites in Afghanistan such as the Pamir region Wildlife Sanctuary, Band-e-amir National park, Nuristan forests, among others. He explained the impacts of human-created threats like war on these ecologically rich areas. With this background he put forth the need for raising the awareness of the people. Though there are 19 universities in Afghanistan, he stressed that there is no provision for Environment Education from Primary to Higher education in Afghanistan. ECFA is making efforts to change this for the better. Now the Ministry of Education and Higher Education is planning to change the curricula as per the needs of Environmental Education.

#### **Presentation – 2: ‘Here and Now, There and Later’**

By Mr. Chris Maas Geesteranus, International Officer, IVN Nederland, Association for Environmental Education, The Netherlands

After giving brief introduction of his organisation, IVN Nederland, Mr Chris Geesteranus pointed out some of the root causes of climate change and the need for education about it. He mentioned about the need for self contributions as a key to sustainable development. He spoke of his organization starting a conservation project- IPANET- in Turkey, which actually is a good case study in the making. The IPANET project aims to establish an Important Plant Areas (IPA) volunteer network to promote and protect the IPAs through vegetation inventories, capacity building and public awareness activities in the diverse areas. This project is seen as a unique opportunity for more skills and experience transfer from the Netherlands to Turkey. With this he underlined the importance of local level networks for any conservation efforts to be sustainable. He pointed out that our educational concerns about the world should not be restricted to issues ‘here and now’, but increasingly should include issues ‘there and later’. With that he meant that our influences on ecology and culture extends it far beyond national borders and thus will also have an impact on future generations.

**Presentation – 3: ‘Education towards sustainability concerns of Natural Resources in Fragile Ecosystems - An exercise in knowledge management: Need of the IHR for ecological and livelihood security’**

By Prof L.M.S. Palni, Special Scientific Advisor Biotechnology & Project Director State Biotechnology Project, Government of Uttarakhand, India

Prof Palni linked the theme of the session with the principles of Agenda 21 of the Earth Summit. He discussed the positive and negative attributes of a mountain ecosystem: the negative attributes being fragility, inaccessibility, and marginality of the mountain ecosystem. He also mentioned the need for optimum intensity in the work at the grassroots level. Prof Palni underscored the important role played by culture and religion in the knowledge management process. While giving example of cultural role he gave an example of solar cookers distribution in the Himalayan region, how the solar cookers were just used by the locals as storage container rather than to serve its purpose because where they were applied the culture of the people did not allow them to cook rice in the open. While distributing those solar cookers the cultural aspects of the community were not taken into consideration. Prof. Palni used this example to illustrate the need of bridging the gap between the technology developer and the technology user.

Religion can be very effectively used to convey major messages of ESD. Prof Palni gave an example cum study conducted in Badrinath, India, a Holy place for Hindus. For this innovative initiative, the priests of the area were made aware about the importance of plantation. As a result saplings were distributed as *Prasada* (blessings from God) to the pilgrims, with instructions to plant them in their homes. This initiative turned out to be very effective, Prof Palni added. He emphasized the need for initiatives by the universities to study in the setting of the harder areas of the mountain. He called upon the setting up of what he called ‘IIRTM’s’ (Indian Institutes of Rural Technology and Management) in different agro climatic regions in the country along the lines of IITs, if we (India), as a nation, are serious about rural reconstruction for sustainable future. It is high time, he said, to do something concrete in this 60th yr of India’s independence. He stressed that the conservation efforts should have some kind of "reward" mechanism, such as in the form of payment for environmental services for communities conserving their forests.

In parallel, Prof Palni suggested the need for establishment of RRCs (Rural Resource Centres) at the Block level in each hill district, as effective conduits for the transfer of appropriate technologies.

He concluded his talk by reciting famous *vaidic* slogan ‘*Vasudhaiv kutumbakam*’ (the earth is like a family) and hence the need to work together as a single family for our one and only home, Mother Earth.

Quote by Prof Palni: ‘***Conservation without compensation is only conversation***’

**Innovative effort** suggested by Prof Palni et al: Establishing ‘Rural Resource Centres’ (RRC) for proper dissemination of knowledge and transfer of technology

**Presentation – 4: ‘Importance of Traditional Indigenous Knowledge Systems for Environmental Sustainability in Chittagong Hill Tracts of Bangladesh’**

By Dr. Khaled Misbahuzzaman, Associate Professor, Institute of Forestry and Environmental Sciences, Chittagong University, Bangladesh

Through a case study from the upland watersheds of the Chittagong Hill Tracts (CHTs) in south-east Bangladesh, one of the most fragile forest ecosystems in the country, Dr. Khaled shared the example of use of traditional indigenous practices in Village Common Forests (VCFs). VCF communities carefully maintain perennial streams on which they depend for year-round water requirements. The VCF knowledge systems are rich in natural resources management to secure environmental sustainability in the CHTs. He pointed out the need for governments to pay attention towards such local level sustainable efforts.

### **Discussions/questions/experience sharing**

Ms Joyce Mendez of ICIMOD, Nepal raised the question about the methods of evaluation of the work we do in relation to the sustainable initiatives, as they may be instructive in replicating these efforts.

Ms Sujatha Padmanabhan of Kalpavriksha, Pune, India shared her Educational experience in the Ladakh region. Sujatha mentioned about the lack of locale- specific examples in the texts. She cited her initiative with a Ladakh-based NGO SECMOL (Students' Educational and Cultural Movement of Ladakh) to revise the text as per the local needs. She shared the design of SECMOL building which is energy saving and eco-friendly model for the cold regions. This work is going on since 17-18 years and the NGO is also conducting one-year course in the construction designing of solar buildings.

The 'importance of educating government to make them aware of environmental needs is one of the recommendations given by Janaki Andharia, Professor and Chairperson, Centre for Disaster Management, TISS, Mumbai.

Mr Dhiresh Joshi of Wildlife Trust of India raised a point about the necessity of having concern towards wildlife while involved in any talk about sustainable development.

Dr Rakesh Sundriyal of G B Pant Institute, India raised the debate on 'Prosperity vs. Sustainability'. With common discussion it was understood that there is equal need of optimum prosperity. Then and only then can people think about Environmental needs for common good.

### **Theme – 2: POTENTIAL ADAPTIVE STRATEGIES FOR SUSTAINABLE NRM AND LIVELIHOODS IN RESPONSE TO ENVIRONMENTAL CHANGE.**

#### **Chair: Prof L M S Palni**

Special Scientific Advisor Biotechnology & Project Director  
State Biotechnology Project  
Government of Uttarakhand, India

#### **Rapporteur:**

**Mr. Ujol Sherchan**  
ICIMOD, Kathmandu, Nepal

#### **Co-Rapporteur:**

**Mr. Dharmaraj N Patil**  
CEE, India

**Presentation – 1: ‘Natural Resource Management and peoples’ livelihood in response to global changes: A case study in the Transhimalayas (Manang case).**

By Prof R P Chaudhary, Central Department of Botany, Tribhuvan University, Kathmandu, Nepal.

Prof Chaudhary shared a case study of three villages in the mid-Nepal Himalaya: Manang, Ngwal and Phoo. He explained the different conditions prevailing in these villages where Manang people have followed traditional practices / ways of life with peoples’ participation for centuries. Today Manang is on the path to prosperity. In this village the local clan used to govern the use of natural resources such as grass-cutting, and collecting of dung pellets. They have also modified the traditional irrigation practices as per their need. By diversifying to other livelihood options (*Cordyceps sinensis*, seabuckthorn, etc) as well as taking advantage of the opportunities posed by global change – esp. climate change, and globalization - this community has adapted and fared very well. However, there are still more negative impacts than positive impacts in Manang, and how this community will deal with the coming of the road remains to be seen. According to Prof Chaudhary, Phoo village on the other hand is the best example of developing tourism based on the entrepreneurial skills of the locals. He also mentioned the traditional practice of Amchis, the traditional healers of the High Himalayas with local knowledge of plants with curative powers.

Quote by Prof R P Chaudhary: ***‘It would be more realistic to consider mountains as dynamic, certainly not fragile’***

**Presentation – 2: ‘Payment for Ecosystem Services: Need for an Institutional Framework’.**

By Prof G. Kadekodi, Institute of Social and Economic Change, Nagarabhavi PO Bangalore, India

Prof. Kadekodi emphasized the need for establishing ways of compensating for ecosystem services. Two things need to be factored in: 1) conservation/restoration carried out by the locals need to be valued, 2) These should be properly compensated and regarded. For instance, the down stream people should compensate the preservation efforts by upstream people. How to make the above instruments come in to action? He stressed that Institutional framework is the only key. There must be PES for water, land use, value of ground water recharge, flood control, carbon sequestration, biodiversity conservation. For that to happen there has to be community based more work done on valuation of ecosystem services. At present, monetary values for soil retention services, flood control, carbon sequestration, biodiversity protection etc., are available only at state and national level in India. There is a need to have these estimates at the eco-systems/regions and micro levels, to be built into the institutional framework of claims and use for further protection works. At present just about 3 out of over 600 CDM projects contracted in India are on forestry, All others are on energy saving, energy switching etc.

It is difficult to administer forestry projects under CDM for the reason that thousands of villages are involved, to be compensated for their contributions. With Decentralisation and autonomy presently available under the Panchayat raj system in India, Bangladesh and in Nepal it is possible to introduce key components of the governance and

empowerment. Other examples of such feasible institutional frameworks are for wildlife management, lake management etc.

Main message: Compensation is key, and institutional framework is needed and governance needs to bring it under the Panchayat raj systems.

### **Discussions:**

Ms. Joyce Mendez, ICIMOD, Nepal: Kyoto Protocol commitments are up for renewal in 2012, and next week in Bali the process of this review begins. How do we push for payment of environmental services of forest communities? Are there concrete initiatives in this direction, with concrete recommendations?

Prof Kadekodi: KP is based on individual initiatives. Governments use fiscal instruments such as carbon tax. But what is required is the institutional framework for the entire community, a community system. Of the three funds under the KP, most of them are un/underutilized. We need to make sure a certain percentage of the funds accessed only for ecosystem service compensations.

Mr. Dhires Joshi, Wildlife Trust representative: Wildlife-human conflict is common. There should be compensation for crop depredation to farmers so that they don't go around killing wildlife. Likewise there should be compensation for wildlife as well.

Prof Kadekodi: Relocation of villagers from national parks has happened. The Wildlife Act and the Tribal Act are bit in conflict. Concept of coexistence needs to be operationalised by better land use planning – e.g. wildlife corridors or buffer zones. The core area for wildlife should be expanded while relocation should be in buffer areas in similar agricultural eco-zone to ensure the survival of the displaced – not 200-300 kms away, so as to minimize wild-life conflict.

Comment: Dr Rakesh Sundriyal, G B Pant Institute, India: The fund given by government should percolate down to village level system.

### **Presentation – 2 'Potential Coping Mechanisms: Building on Community Practices'**

By Dhruvad Choudury, ICIMOD, Nepal

Dr Dhruvad's presentation was based on anecdotes and experience. He mentioned a few of the local impacts of climate change in North East India: a) change in rainfall patterns, and longer dry spells, with implications for agriculture (change of agriculture calendar); b) mosquitoes increasing with increase in associated health risks (e.g. malaria); c) flash floods becoming more frequent and unpredictable. Because of flashfloods, transporting perishable produce to market on time is becoming a challenge.

While giving illustrative examples of the community practices he minutely pointed out many of the advantages Shifting Cultivation has over the modern agricultural practices. Overall he pictured shifting cultivation as an integrated system that never had pest problems. However, with climate change even shifting cultivation now has to deal with pests. He said little work has been done on adaptive strategies at all levels.

Under coping mechanisms, he stressed understanding of the traditional practices and use of integrated systems like shifting cultivation, which offers a great potential in terms

of crop diversity and diverse gene pool. In terms of crop diversity, landraces adapted to microhabitats as well as rice varieties resistant to floods hold out a promise to contribute to UN's Hunger Free World by 2020.

Quote by Dr. Dhruvad Choudhury: '*There is need of more of interfaces between farmers and technical people*'.

### **Discussions:**

Prof. Kadekodi: There is traditional knowledge, yet we still hear of "educate the villagers" etc? Education has to come in somewhere. Any thoughts?

Dr. Dhruvad: Example of pest management in 3 districts of Assam. No technical people/ extensions in these villages. The communities said they didn't need technical help. When a study was carried out, it came up with over 100 Traditional Knowledge practices to deal with pest problem. Farmers would question scientists with their problems – no/few answers forthcoming. More interfaces required between farmers and technical people. The knowledge flow cannot be top down, it has to be two-way. And of course, there should be better appreciation/recognition of traditional knowledge.

Prof. Palni: Should something be done in terms of "compensation" to the custodians of various landraces which were utilized in the development of a modern hybrid of rice IR-72 (Int'l Rice Research Institute, Manila). The reported pedigree of IR-72 shows that a total of 22 landraces were used and that they were obtained from 7 different countries. What should be the approach in cases!

Dr. Dhruvad: They should compensate all the communities that had protected those landraces.

Prof Palni talked about big dams resulting in actions such as compensatory afforestation, and said such decision is made far away from the area/people impacted, which is unfortunate. Rather than just say "don't cut forests", he opined that subsidy should be given to the locals (firewood users) for switching to alternatives rather than just use the money for af/reforestation.

Prof Kadekodi talked about governance/rules. He gave an example of Sukumadevi village in Haryana where the community didn't let their livestock go to forests for grazing. They resorted to stall-feeding. The forests regenerated as a result, recharging ground water. Five water tanks were full. Now the question came: how should the water be shared – who should get the water?

Dr. Dhruvad: 37 out of 82 families – only those who owned land – got the water right. But every household should have the water right – independent of whether it has land or not. Not only everybody should have the water right, but every individual who has the water right should have the right to sell his/her water right to somebody else as well.

### **Theme – 3: KNOWLEDGE MANAGEMENT AND DISSEMINATION STRATEGIES.**

**Chair: Mr. Chris Maas Geesteranus, Netherlands**

**Rapporteur:**

**Mr. Dharmaraj N Patil**

CEE, India

**Presentation – 1: ‘Sensitising Communities towards Sustainability’.**

By Padmashree Natawar bhai Thakkar, Nagaland Gandhi Ashram, Nagaland

On the basis of his experience of working at ground level Natwar bhai made a point that the ‘mega’ word has become a threat to the Environment. Though he did not talk on any specific environmental issues he guided about the needs of working and sensitizing public at large.

Some of the major quotes came out of his talk are:

- High Value, low volume crops are should be promoted
- The days of religion and politics are over, the future belongs to science and spirituality’
- ‘Non-holding’ (collecting only as per needs) psychology of mind needs to be nurtured’
- Need to nurture *Sanyam* (self control) and *Aparigriha* (non acceptance of charity/subsidy) in the individual or the self: these are keys to sustainability.

**Presentation – 2: ‘Heritage Sites as Educational Learning sites’.**

By Dr. Ramboojh Yadav, UNESCO, New Delhi, India

Dr Ramboojh talked about the importance of World Heritage Sites and the effects of Climate Change on them. Biosphere reserves very often are also exposed to the problem of community conflicts. It is extremely important to educate communities about the importance of these protected areas and the need to protect them for the betterment of human kind. He also emphasized upon the need of empowering communities for alternate sustainable income generation activities that help in the conservation. Referring to the plenary talk by Dr Natarajan Ishwaran, Director, Division of Ecological and Earth Sciences, UNESCO, he gave an account of UNESCO’s plan about elevating the Heritage sites into Educational Learning sites for children.

**Presentation – 3: ‘Strategies for Managing and Sharing Mountain Knowledge in the Himalayan Region’.**

By Ms. Joyce Mendez, ICIMOD, Nepal

Picking up the thread from earlier panel discussions that technologies are available and there is not a dearth of them and of information, Ms. Mendez began her talk about knowledge management as bringing knowledge to those who need it, and in the development context this is to those who need it the most: the poor. Knowledge management came about in realisation of the knowledge sharing gap. She spoke about the basics of knowledge management and the initiatives in the field by various agencies including ICIMOD. Citing the example of the HKH region, she said that the recent IPCC report mentions that the HKH is a climate change hotspot because of the absence of specific data from the region on such areas as meteorology, hydrology, etc. And that knowledge centres like ICIMOD should try to fill in this niche by providing data and linking the region to international science and research institutes. Modern computer tools

such as GIS/DSS can be useful in forecasting scenarios and preparing communities and educating policy makers. She also mentioned multi-media, alternate media, mass media, participatory 3D modeling etc as some of the innovative effective tools for knowledge generation, sharing and exchange, which will help us cope with the uncertainties that climate change will bring. She mentioned that at ICIMOD, the Centre has fostered various discussion groups, communities of practice, showing some of the websites where discussions were taking place to share information, even influence policy makers.

Quote by Ms Joyce Mendez: **'The irony of the Information Age is the 'Digital divide'**. While many countries are reveling on the wonders of the Information age, one-third of humanity has no substantial education, and some still do not read or write!

### **Discussions/Issues:**

**EE** for judges in Nepal - Prof Chaudhary

Bureaucratic inertia is the major hurdle- Nimesh, Samrakshan, Meghalaya

Motivating custodians of natural resources is the challenge - Dhires, WTI

Recommendation: Need for initiatives in the areas of Legislature, Judiciary through training camps, among others

Transition between two ages of technology

After declaring some sites World Heritage Sites, such as in Nepal, it appears that there was no support to improve some of the sites. Also, some people-parks conflict stem from people not being involved from the beginning of the process of declaring conservation sites - Joyce

Summing up:

Many of the points raised during the discussions were actually reconfirmation/echoing of previously views from past workshops. We must move from workshops to recommendations and from recommendations to action.

Day 2: (26.11.07)

### **Group Work to identify future ESD strategies for Fragile Ecosystems:**

During the first working session of the two sessions available on the second day, participants formed three groups to discuss the future directions of education to address to - (a) the sustainability concerns in Fragile Mountain Ecosystems; (b)

Potential Adaptive Strategies for Sustainable NRM & livelihoods in response to environmental change; (c) Knowledge management and dissemination strategies.

Participants opted for the groups of their choice based on their interest and experience.

The group discussions were moderated by Prof. R.P. Chaudhary (a); Prof. Kadekodi (b) and Mr. Ujol Sherchan (c). Dharmaraj Patil, Ujol Sherchan and Tek Jung Mahat were the rapporteurs for each group. After a discussion for an hour and half the groups summarised their findings and made recommendations

Later during the second session each group presented their recommendations. Mr. Chris Maas Geesteranus chaired the session.

Presentations by groups were given by:

- A. Sustainability Concerns in Fragile Ecosystems – Prof. R P Chaudhary
- B. Potential Adaptive Strategies for sustainable NRM and livelihood in response to Environmental Change – Tek Jung Mahat and Memma Singha
- C. Knowledge Management and dissemination Strategies – Ujol Sherchan

Presentations were followed by discussions and a summarisation by Prof. Kadekodi. Group-wise recommendations are as follows:

<b>Group A: Sustainability concerns in fragile ecosystems: Areas 1) Biodiversity and biological resources; 2) Livelihoods, 3) Access to information</b>			
	Issues	Root causes	Recommendations
	Biodiversity loss/depletion (cultural diversity)	<ul style="list-style-type: none"> <li>- overexploitation</li> <li>- pollution</li> <li>- illegal trade</li> <li>- trans-boundary issues</li> <li>- exotics/IAS's</li> <li>- ignorance</li> <li>- forests, grassland, etc loss</li> </ul>	Comprehensive documentation /emphasis on : <ul style="list-style-type: none"> <li>- socially valuable species</li> <li>- ecological valuable species</li> <li>- keystone species</li> <li>-</li> </ul> Habitat management (ecosystem/landscape)
	Valuation of ecosystem services	<ul style="list-style-type: none"> <li>- lack of knowledge</li> <li>- lack of compensation</li> </ul>	Amend/introduce EE curricula at higher and lower levels; formal/non-formal education, bureaucracy (give emphasis on region-specific case study, incorporate local needs, value of tropical diversity  Mechanism of compensation development  Valuation of ecosystem services
	Management of water bodies /resources in fragile ecosystems	<ul style="list-style-type: none"> <li>-change in climate pattern</li> <li>-lack of adoption of low cost technology</li> </ul>	Adaptation /mitigation to water use/resources  Adopt traditional ways of water conservation  Interchange of

			knowledge between formal and non-formal sectors
	Sustainable livelihoods	<ul style="list-style-type: none"> <li>- GMOs</li> <li>- Use of excessive fertilizers</li> </ul>	<p>On farm: Maintain agricultural productivity (crops, animals, etc)</p> <p>Inventory of conservation and use of locally suitably adapted species/landrace under extreme conditions, habitats</p> <p>Off-farm: Beekeeping, sericulture, bio-prospecting, tourism, niche products</p> <p>Establishment of rural technology management centre</p> <p>Harvest low-cost energy</p>
	Access to information at district/village/local level about climate change	Commitment and networking lacking	<p>Establish long term observatory</p> <p>Develop model and generate data to be handled by villagers under local situations</p> <p>Dissemination of knowledge at all levels</p>

<b>Group B: Potential Adaptive Strategies for sustainable NRM and livelihoods in response to environmental change</b>			
	Issues	Impacts	Adaptive measures
	Increasing fragility both man made and natural	Alteration of the natural system	Mitigation measure
		Changing ecological strength	Addressing both visible and invisible threats, e.g., tremors etc
	Threats to livelihood and shrinking resource base	Demographic change, population displacement - immigration	Introducing value alternative livelihood options, empowering women and local government, training

			them on better utilization of fund and other resource, allocation of financial resources at local level
	Conflict between community and government divisions	Absence of community participation at decision making level	Identifying the issues needs to be addressed in an integrated manner, sensitization of policy makers, community awareness and training programmes
	Change in land use pattern (Jhum to commercial)	Loss of biodiversity, soil fertility, shrinking of ground water, irreversible ecological loss	Introducing value added processing activities with local products (indigenous)
	Release of unclassified forest for non-forest purposes	Use for commercial purposes e.g., industry, rubber plantation etc; loss of biodiversity, ecological alteration and net reduction of forest coverage	Imposing policies to make eco-friendly use of unclassified lands
	Government policy to promote cash crops	Marginalise the traditional dwellers, subsistence (within jhum), cultivation area shrinking, invasion of new species resulting to biodiversity loss	Role of Cooperatives and local government is needed, exposure needed for local governments and institutions
	More pressure on per unit land	Unsustainable farming and attraction towards commercial farming	Adding values to local products, economic diversification, valuation and compensation mechanism (payment for ecosystem services)
	Water scarcity	Productivity loss, impact on biodiversity (overall ecosystem e.g., elephants)	Revival of traditional water harvesting and retaining methods
	Curriculum indifferent to environmental issues (fragile ecosystems)	Less understanding and recognition of the subject	Inclusion of the subject matter at different levels most importantly in undergraduate courses

### **Group 3: Knowledge Management**

- Local people have to be involved in the development and packaging of knowledge;
- Tap old people (village elders) to speak to the locals /young people about conservation;
- If environmental education doesn't translate into action – it means nothing. If you cannot link environmental education with projects, do not even do them.
- There has to be two-way communications, it cannot be top-down. Normally we don't give a platform for the local community to respond/ react to the issue that affects them.
- Showing conservation related films to local people and giving them space to discuss ém or relate their own experiences can throw up surprises (e.g. a Garo lady perceived to be lazy is likened to the female hornbill). This can be a starting point for initiating/promoting dialog on conservation;
- Where literacy is low or local language scripts non-existent, visual medium (pictures of species, films) can be a very good tool for outreach as well as for involving the locals in conservation;
- Build relationship with local press – send updates regularly. Soon local Garo paper started bringing out articles/reportings on conservation;
- Develop an audio-visual around a particular issue and get locals to give their views on the issue, play that audio visual to the policymakers and capture their reactions etc and take these back to the locals. This would be a one way of taking local issues to the policy level by establishing a mediated two-way communications. Later if there is interest, the mediator can arrange a face to face between the two parties to address the issue.
- WWF-India: Himachal Pradesh case: Formal education has limitations. Training of teachers not always possible. What WWF has done is mainstreamed EE into income generating activities such as ecotourism, and value additions.
- Local people in NE India where Samrakchan worked in wild conservation are now involved in conservation themselves, sometimes even assuming the “Watch Dog” role (illegal logging). This can be taken as an indicator of success.
- Existing EE materials should be recycled/reused with contextual add-ons.
- Projects – even EE related ones – have a timeline. How to ensure sustainability so that the good work continues long after the project has folded continues to be a challenge.
- Providing education (or reaching out) to mobile groups (practitioners of transhumance as well as nomads) in the mountains continues to be a challenge. Successful models of mobile schools should be scaled up.

The draft recommendations made by different groups were reviewed by all the participants and each participant marked five most important points out of all the recommendations made by 3 groups.

Day 3: (27.11.07)

Draft recommendations for the WG prepared under three main heads – (1) Knowledge management, (2) Participation, (3) Education and training were presented for the final comments/suggestions by the participants.

Suggestions that got endorsement from maximum participants were put as final recommendation in order of priority. After a thorough discussion, the WG recommendations were finalised through a participatory process.

A pre-workshop discussion was initiated by CEE on Asia Pacific Mountain Forum network (APMN) on the issue “Education for Sustainable Development” which received an overwhelming response from around the world. The major recommendations emerged of this discussion were also taken into account while finalizing the WG recommendations.

### **New Ventures**

**Definition of Fragile Ecosystems:** The group discussed the existing definition of the fragile ecosystem and unanimously agreed that climate change and subsequent aftereffects are putting more and more ecosystems into the category of Fragile Ecosystems. According to Prof. P.S. Ramakrishnan the most fertile Indo- Gangetic plains exposed to new threats are also becoming fragile.

**Commitment for taping and sharing more and more information:** Workshop partner ICIMOD, Nepal is intensively involved in collecting information on diverse issues related to sustainable development in the mountain regions. This information is accessible through a number of websites maintained by ICIMOD. ICIMOD has also come up with a large number of publications reflecting on the life of mountain people and sustainability issues. All these publications are available online. A commitment was made for more intensive taping and sharing of information. All the workshop participants have been invited to join the Mountain Forum-APMN (Asia Pacific Mountain Network), a network of individuals and organizations working in the areas of sustainable mountain development from around the world.

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## **Recommendations WG 11: Education towards sustainability concerns of natural resources in fragile ecosystems**

The above discussions, prioritising and final selection processes lead to three categories of recommendations:

- knowledge management (documentation and exchange of knowledge)
- participation of local people in decision-making processes and actions
- education and training to achieve a balance between livelihoods and conservation

### **Knowledge management**

1. Develop for use during education programmes, comprehensive documentation of:
  - socially and ecologically valuable species
  - keystone species
  - fragile ecosystems
  - locally adapted species/landraces under extreme conditions and habitats
  - social relations in the cultural landscapes
  - values/interests of the communities (farmers, conservationists, government, traditional leaders etc.)
  - adaptive strategies and mitigation measures to the impacts of climate change
  - present and future economic scenarios
  - perceptions and attitude towards conservation issues
  - power relations between stakeholders.
2. Build capacities of communities to gather, access, maintain, and update database.

### **Participation**

3. Promote advocacy to discourage mega-dams and promote revival of traditional technologies appropriate to local conditions
4. Adopt the Ecosystem Approach as one model for involving people in local communities in conservation and sustainable use of their natural resources.<sup>1</sup>
5. Enhance the capacity of local communities for advocacy to ensure payment for environmental services.

### **Education and training**

#### *Issues*

6. Redesign educational curricula incorporating region-specific subject matter at all levels.
7. Introduce thematic courses in higher education about region-specific issues relevant to fragile ecosystems.
8. Introduce alternative livelihood options, e.g. by training people in developing eco-friendly, economically diversified use of 'unclassified areas' (*areas without conservation status*) such as for eco-tourism and small-scale diverse forest plantations.
9. Train local communities, especially women and the marginalized, and local governments on better allocation and utilization of resources.

### *Target-groups*

10. Create the enabling conditions for education and awareness raising for all stakeholders including the government about the values and services provided by the ecosystems. This should be done in open communication processes that have the character of experience sharing and mutual learning.
11. Provide adaptive forms and methods of education for migratory groups such as practitioners of transhumance in remote areas. Scale up successful models of 'mobile schools'.
12. Visitors and migratory population should be made aware of their co-responsibility to conserve the ecological and cultural qualities of the area.

### *Educational tools*

13. Where literacy is low or local language scripts non-existent, use alternative and visual media (pictures of species, films around particular issues, theatre, puppetry, folk arts etc.) for outreach as well as for involving local communities in conservation education.
14. Developing the curriculum for graduate and post-graduate level courses to include theories and practical ways of assessing/estimating values of eco-system services, and using them to educate the local communities, to empower them to bargain for their rights to receive compensations.

### *Educational infrastructure*

15. Setting up a chain of Rural Resource Centres as conduits of appropriate technology for use in the rural sector e.g., traditional water harvesting, land use and management systems and others.
16. Strengthen local institutions and foster dialogue to facilitate communication, education and training processes through formal and non-formal sectors.

### *Continuity*

17. Design education and communication programmes to ensure follow-up action by the community and promote local ownership of the initiatives introduced for long term sustainability.

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