PROCEEDINGS OF THE UGC SPONSORED SEMINAR

ON

HUMAN DIMENSIONS OF ENVIRONMENTAL ISSUES AND CREATIVE EDUCATION

ORGANISED BY

SILIGURI B.ED. COLLEGE

19 APRIL AND 20 APRIL 2005

SILIGURI B.ED. COLLEGE
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Siliguri B.Ed. College

11 June 2007

UGC Sponsored Seminar
On
Human Dimensions of Environmental Issues and Creative Education

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Preface

We are happy to present here the proceedings of a Seminar on Human Dimensions of Environmental Issues and Creative Education that was held on 19 and 20 April 2005 in this college. The seminar was sponsored by the University Grants Commission.

Theme of the Seminar :

Initially environmental problems were thought to be straight forward and local in character. Therefore people attempted to solve the problems locally and in a very simplistic manner. Gradually it was recognized that all the environmental problems are global and complex in nature. This character comes mostly from the existence of human being.

The relationship between man and environment appears to be a paradox. A paradox contains seemingly contradictory statements. Yet both of these can be true. The efforts of the educators on the environmental issues have proved beyond reasonable doubt that the fundamental paradox governing the relationship between man and environment is really man's own creation. It is merely a projection of the contradiction that already exists the society. The environment acts upon a person and the person acts upon environment. Therefore, we normally try to answer the questions like – 'What should be the most desirable relationship between man and environment?' There lies the importance of creative thinking. One arrives at an apparently peculiar conclusion that helping a learner to think creatively may help her /him to have a better understanding of the environment and a better interaction with the environment.

General objectives of the seminar :

(i) to learn more about environment and creative thanking, and

(ii) to exchange views among the teacher educators.

Specific objectives of the seminar :

(i) to provide a forum for interaction of academic faculty from environmental sciences & the discipline of education,

(ii) to arrive at environmental issues of current relevance in society, and

(iii) to delineate strategies for the successful implementation of environment education programs.

Sub - themes of the Seminar :

(i) environmental issues,

(ii) development & emergence of environmental concerns,

(iii) education for healthy environment, and

(iv) creative thinking and its relation with environmental education.

Most gratefully we acknowledge the financial support extended by the University Grants Commission. Mere thanks are not enough for my respected colleagues, teaching and non-teaching, who came forward to help me whole heartedly at all the phases of the execution of the total project. I want to express very sincere thanks to the President of the Governing Body, Principal, and other members of the Governing Body without whose constant support it would have been impossible for me to make such a responsible task a grand success. Last, but not the least, thanks are due to Sri Kaushik Dutta who took all the pains with an ever smiling face to see that the present publication really comes on earth.

I invite the reader to go through the contributions from innovative minds. Before I do that I express a very personal feeling of my heart for two learned couples from Sikkim Government college, Dr. D. S. Bhattacharjee and Dr. Vardhini Bhattacharjee who, I do not know why, loved me so much, and gave all kind of shelter throughout the execution of the seminar.

Nita Mitra

Date: 11.06.2007

(Dr. Nita Mitra)
Convener

CONSOLIDATED REPORT OF THE UGC SPONSORED SEMINAR ON "HUMAN DIMENSIONS OF ENVIROMENTAL ISSUES AND CREATIVE EDUCATION"

ORGANISED BY SILIGURI B.ED COLLEGE ON 19 & 20 APRIL, 2005

The inaugural session began with a welcome address by the Principal, Siliguri B.Ed College, Dr. P.K. Chanda. This was followed by the Hon'ble Vice Chancellor of the North Bengal University, Professor Dr. P.K. Saha. Highlighting the importance of the theme of the seminar, he reiterated what Engle's had pointed out in the Dielectics of the Nature that a void had been created in Nature which cannot be filled by humankind. With profound data from environment the world over, he drove home the fact that a synthesis of two extreme stands – that of the determinism on the one hand, and man is the creator of his environment on the other- has to be achieved which in fact is the concept of Sustainable Development. In concluding, he emphasized on the need for developing indigenous technology through public-private partnership.

Dr. Nita Mitra, Convener of the seminar, and Sr. Lecturer in geography of Siliguri B. Ed. College, very lucidly delineated the theme of the seminar and this was followed by the Keynote Address delivered by Dr D S Bhattacharjee, Reader & Head of the Department of Education, Sikkim Govt. College. He stressed upon the multidisciplinary nature of Environmental Education and pointed out that educators have a great responsibility to work out strategies to concretize the implementation of Environmental Education. Md. Nurul Islam, the Chief Guest of the seminar and the Deputy Mayor of Siliguri Municipal Corporation, briefly highlighted the importance of orgainsing this kind of seminar in the context of local urban environment. However, he insisted that mere academic discussion may not be able to do anything unless people, especially those from the higher income group, become aware of the consequences of multilating the environment. Mere law may not be able to control the situation. Dr. Dilip Kumar Sarkar, Controller of Examinations of the university of North Bengal, stressed upon giving emphasis on humanity. He supported the key note address by Dr. D.S. Bhattacharjee where it was mentioned that there was contradiction between development and environment. He proposed that Techno-commercial ethos had to be replaced by Eco-commercial ethos. One has to shift the mind-set as well,–e.g. monoculturism to multiculturism. Quoting the great thinker Aristotle he wished if

we, human being, could live for changing the world in a way which ensures comparatively better livable world. Dr. Partho Das, Principal, Suja Sen college and presided over the inaugural session. In his speech he said that, 'Possibly, hope and agony both were with the primitive who discovered fire. Because, that indicated innovative use of fire. At the same time that indicated destruction of nature.' However, he was optimistic and he insisted on keeping the journey of human civilization in tune with nature herself. While appreciating the rules, regulations, court verdicts in favour of environmental awareness he opined that all these might fail unless an emotional touch with the nature be nurtured. Dr Tapas Kumar Chatterjee, Registrar, University of North Bengal observed that the seminar is rightly reviewing the assault on environment and consequences. However, the issue has political and economic dimensions as well, he added. He referred to the speech of the Hon'ble Vice Chancellor and the keynote address by Dr. D.S. Bhattacharjee where it was mentioned that poverty, underdevelopment and environmental degradation were all integrated leading to a vicious circle. Environmental awareness is to be inculcated through proper education so as to combat with the vicious circle.

Other dignitaries present at the inaugural session also shared their views on the theme of the seminar which provided valuable framework for the academic sessions to follow. The session was concluded with a vote of thanks proposed by Prof. Nityagopal Mondal, Lecturer in Chemistry of Siliguri B.Ed. College. The inaugural session was nicely anchored by Prof. Rituparna Basak, Lecturer of English of Siliguri B.Ed. College.

On the first day of the seminar, in all there were ten papers presented which were distributed over three academic sessions. Prof. S. Patra, Officer-in-charge, Govt. Teachers' Training college, Malda charied two of these sessions and Dr. Rathindranath De, Director SCRET, Govt of West Bengal, chaired one Session. While a few papers focused on particular aspects of the physical environment, a couple of these were region specific papers and there were also a few papers emphasizing the aspects of Environmental Education. Professor Dr. M.M. Jana, Dr. A. Burman, Dr. S Rakshit and Dr.S.Chattaraj examined multifarious aspects like demography, deforestation, timber industry and the shifting paradigms in relation to environment. The region specific papers presented by Professor Dr. S.R. Basu on Darjeeling district and Dr. Mandira Chakarborty on Malda district reported intensive studies of these regions with a view to cub environmental problems therein. Yet another category of papers focused on the human aspects and the role of education with regard to environment. Prof Sankar Chakrabrty, President, Paschim Banga Vignan Manch advocated a people centered

approach while Dr. A. Mukherji worked on the idea that prior to environmental education, basic issues related to poverty, population and productivity need to be examined. Development of creative thinking as a strategy to environmental education was the thrust of the paper presented by Dr.Debjani Guha. Concrete steps being taken in the direction of environmental education emerged in the presentation made by Ms Sridevi Das Gupta who detailed out the modalities adopted by the SCERT on this area.

On the second day there were two academic sessions in which a total of eight papers were presented. The first session was chaired by Dr. D.S. Bhattacharjee and the second session by Prof. S.R. Basu. The papers presented by Dr.Rita Sinha, Prof S. Patra, Dr. Vardhini Bhattacharjee and Dr. Sudakshina Purakayastha dealt with different aspects of environmental education. Features regarding water crisis both in the country as a whole and with regard to Darjeeling district in particular were examined by Dr. Krishna Guha and Prof Minakshi Chakraborty. Prof. Urmila Rumba presented the theses that participatory management of forests is inevitable for sustainable development. Moving from narrow perspectives, the global perspective on Environment was presented by Dr. T.K. Chatterjee, in which he emphasized the need to change the international order and called for rethinking of the present development models.

The last academic session was chaired by Prof. Dr. M.M. Jana. The papers presented in this session mainly concentrated upon various phenomenon in the natural environment and the hazards to the eco system Prof. A Bagchi, Dr. Sheela Datta Ghatak, Dr. S. Bhat, Dr. Md. G. Sabbir and Prof Banarjee gave a kaleodoscopic view of these hazards. But the session ended on appositive note since these papers also suggested concomitant remedies.

In the concluding session which was chaired by Professor Rita Sinha, a brief review of the seminar was presented by Dr. Vardhini Bhattacharjee which was followed by a couple of comments from the participants. The Certificates were distributed to the participants by Professor M.M. Jana and Professor S.R. Basu, the two senior participants.

Md Golam Sabbir, Lecturer in Botany of siliguri B. Ed. College, arranged a very effective audio-visual system throughout the two day seminar. And, from behind the curtain, the office staff and some of the trinees nourished all the participants so as to enable them to contribute full devotion in discussions.

(Reported by **Dr. (Mrs.) Vardhini Bhattacharjee,** Reader in Education
Sikkim Govt, College, Gangtok, Sikkim.)

Presented Papers :
On
Environmental Issues

Environment : Its Degradation And Management In Developing Countries of The World

Dr. M.M.Jana

Formerly Professor of Geography
Department of Geography & Applied Geography
University of North Bengal

Introduction

Environment is the external conditions and influences affecting the life and development of organism. The physical world contains lithosphere, hydrosphere, atmosphere and the biosphere. Earth solid crust down to an average depth of 60 km interior of the globe is the lithosphere. Ocean, lakes icecaps and other water bodies are hydrosphere. The atmosphere comprises the gaseous envelopes of the planets. The biosphere is the important portion of the physical world where life exists.

Human being is an important component of the environment. Various social groups interact in different ways among themselves and cause productive and non-productive and destructive impacts of the biophysical environment (APO, 1989). Examining the socioeconomic environment of third world countries it is found that poverty remains a major concern of the region. Here, more than 2 billion people live in low-income countries and more than 700 million live in absolute poverty. Today environmental crisis is acute and it creates a number of ecological problems. Among the major aspects of environmental degradation are land, air and water pollution, global warming, and depletion of ozone layers, deforestation, desertification, soil erosion and loss of plants and animal species. Although this environmental degradation does not have direct and particular impact only on the poor, indirectly these aspects may contribute to the poverty situation of the country (Bartelmus, P 1986).

The problems of the poor are the lack of jobs for themselves and their growing children, lack of decent housing, lack of means to buy enough food, medicines and clothes, lack of clean water, lack of socio-economic facilities and permanent income (Jana, 1991). Thus, poverty

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and development issues are associated with environment (FAO, 1989). In the last Earth Summit, it was decided that now tendency is to keep poverty and development issues aside and concentrate on resource depletion and conservation of natural environment alone. Preservation and conservation of natural resources are important for development in the developing countries. Development must be a process for improvement of the living conditions of the people in general and the poor people in particular. For improvement of living standard of the people, growth is essential. But sometimes growth achieved in ways these are globally damaging in the long run (WCED, 1987). Not only the growth or development process causes the damage of environment but also it may happen from the lack of development. It is true that due to their survival poor and hungry people will destroy their immediate environment. But some other people are also responsible for environmental degradation (Jana, 1988).

Environment and Poverty

In developing countries, poverty remains a major concern. Other determinants of poverty situation in developing countries are social indicators e.g. literacy, life expectancy, infant mortality rates etc. The distribution pattern of the resources among the people determines dimensions of poverty. In developing countries, land being the principal resources of the rural people their poverty situation is very much related with the land distribution pattern. In these countries, lack of land and malnutrition are highly correlated.

Major Environmental Problems

Degradation in the Atmosphere:

It is a threat to the life support system that arose from the increased resource use. The burning of fossil fuels, cutting and burning of forests release carbon dioxide. The accumulation of carbon dioxide in the atmosphere and certain other gases traps solar radiation near the Earth's surface. This may cause sea level change and some parts of the world are inundated

within a few decades. It could also drastically upset national and international production. Although industrial growth is mainly responsible for most of the greenhouse gases piled up in the atmosphere over the past century. About one-third of the carbon dioxide produced by the human activities is constituted by deforestation and other lands use changes.

Depletion of ozone layers occurs by gases released during the production of foam and the use of refrigerators. A substantial loss of ozone could have catastrophic effects on human and other essential animals.

Degradation in the Seas or Oceans:

The major problems regarding the moraine environment are pollution by oil, sewage, chemicals and metals, depletion of fish stock and exploration of the mineral resources of the seabed. Studies show that "surface contamination in the form of slicks and floating tar was most prevalent near the major tanker routes and that concentrations of dissolved or dispersed petroleum residues in the litter range were present almost everywhere at a depth of one meter in the water column"(Schor,1991).

Degradation of Land:

In the field of agriculture land is the major factor of production. Third worlds countries share about 32 per cent of the world's land area. In 1997, the region accounted for 42 per cent of the world's arable and permanently cropped land. In the year, 62 per cent of the total production and 76 per cent of the agricultural population lived in this region. Land degradation is a process whereby land deterioration through a reduction of soil depth as a result of actions of water, wind, gravity and temperature. Land degradation reduces productivity. Soil erosion, salinisation, desertification, alkalization, water logging and chemical degradation can also degrade Land. Desertification takes place in arid and semiarid areas. About 6 million hectares of productive land turn into desert. If current systems of land use continue, the total area of high productivity cropland will decrease by 60 million hectares by the year 2010 through desertification and conversion to non-agricultural use. About 50 per cent 30 per cent of the total arable lands were degraded in India and China respectively. The percentages of degraded land in Pakistan,

Bangladesh, Sri Lanka, Philippines and Myanmar are 17.3, 7.6, 11.0, 17.1 and 17.3 respectively. Whereas, the percentages degraded land in Vietnam, Thailand and Indonesia are 49.0, 33.9 and 24 respectively.

Depletion of Water:

In the globe, most of the water is ocean water. A minor proportion of the fresh water is available for human use. The main problem is the inequitable distribution of water as a result of which it is not available in the proper places of use. Irrigation is the key input in agricultural development. The necessity of expansion of irrigation facilities in increasingly felt with the rapid agrarian development. Now irrigated area in the world is 250 million hectares. Of which 45 per cent occurred in the developing countries. Although irrigation is used for crop production, it may also bring some negative impact like reduction of soil productivity, through salinisation and water logging. At the global level, about one third of the irrigated land is reported to suffer from soil salinity, and every year additional areas are being engulfed by this menace with the increase of irrigation use.

In the developing countries, there is a high migration of rural people to urban areas in search of employment and other purposes. As a result, city dwellers bound to live in unsatisfactory conditions with inadequate access to the properly treated water or sanitary facilities. This situation leads to contamination of water and creates high pressure on ground water. As a result of inadequate pure drinking water, the people of developing countries become victims of various diseases by drinking of impure water.

Degradation of Natural Resources:

Natural events cause losses of life, limb and resources and thus these become disasters for the humanity. About 20 million people are affected by droughts in 1970s. Nearly 6 million were flood victims in 1960s. Their number is increasing year by year. There is loss of life and blinded by a leak from a pesticide factory in India. In 1991, there was devastating disaster by volcanic eruption and acute flood in China.

Deforestation is the transformation of the forestland into non-forest uses. Degradation is the reduction of the extent and quality of the forestland. More than 12million hectares of tropical forest are destroyed per year and thus over 35 years, would amount to an area about the size of India. According FAO estimation, about 2 million hectares are deforested in the South East Asian countries. Deforestation and degradation of forest resources adversely affect land, water resources, ecology and the environment. As a result of deforestation soils become improvised and loss water holding capacity, there is possibility of occurrence of floods and drought increase in the region. The soil-laden water from the catchments of the rivers reduces the carrying capacity of water causing overflowing. As a result of deforestation, the carbon dioxide of the biosphere is affected. When forests are removed, the habitant of wild life and some plant species are endangered. Deforestation brings bad consequences for indigenous forest communities in term of loss of their source of food, medicines and various services they get from the forests.

Forests play a vital role in the life and economy of the people of a country. Forest cover is effective in checking the spread of the desert by putting up the barrier (Dutta, 1986). Main factors for deforestation in many developing countries are high rate of extraction of forest products by the people and high encroachment in forest area for agricultural lands. Overgrazing and livestock ranching are also played key role in decreasing the forest area and depletion of forest resources.

Encroachment of lands for Agriculture

In the sixteen and seventeen century AD, the rate of growth of population was higher in the developed countries than the developing countries in the world. While the population growth rate of developed countries has lowered down, the population of developing countries is still growing rapidly and at moderate rate (Fig.1). The growth of population in Asia and Africa is very high till now and these continents contribute major share of world population.

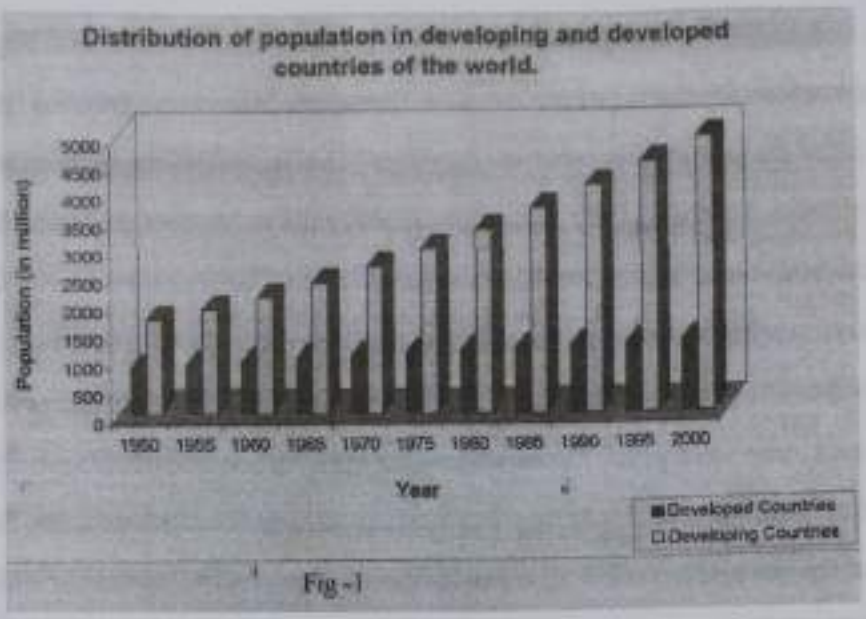

Fig -1

In developing countries, increase of human population is obvious due to non-awareness about the ill effect of population explosion. Given the limited extent of industrialization in these countries, the burgeoning population continuously reinforces, thus compelling people to encroach into forestlands.

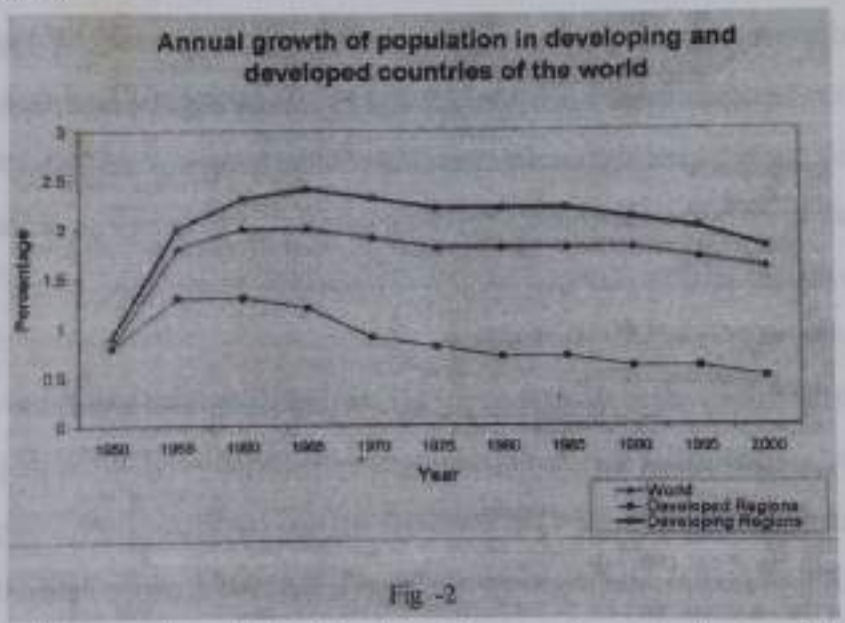

Fig -2

Rapid increase of population of the developing countries causes increase in the demand of food supply which can be met by expansion of agricultural land and increase in productivity (Singh, S. 1997). On-going process of agricultural land had led to disappear of considerable

expenses of forests; conversely, the agricultural lands have increased. Although, disappear of areas can not be attributed solely but a considerable proportion of land of forest are used as agricultural land use (Fig-2). Other factors those are responsible for depletion of forest area are shifting cultivation in the hill areas, spontaneous settlement and planned settlements (Thapa, G.B.1988).Rapid urbanization in the developing countries is also important factor for environmental degradation in the towns in the developing countries.

The percentage share of urban population to the total of the world in the developing countries is always high though the growth rate of urban population in these countries is comparatively lower than developing countries (Fig.3).

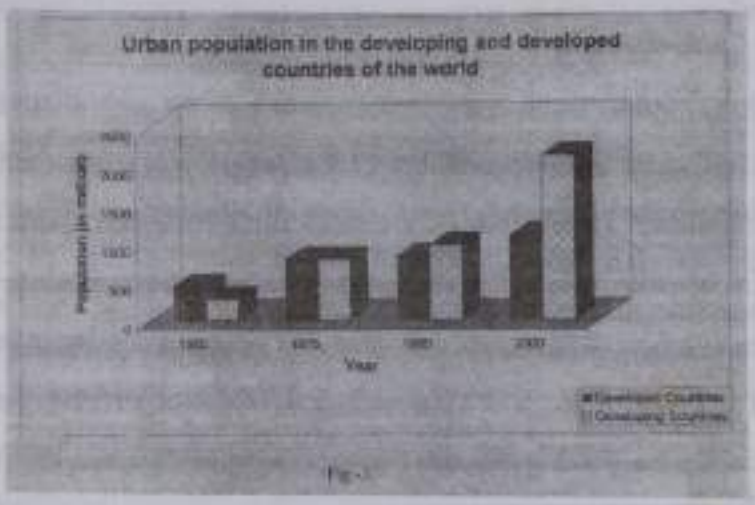

Fig -

But this high growth of urban population in the developing countries creates many environmental problems like air and water pollution in the urban centers (Fig-4). Increasing urbanization increases concentration of population in a limited space, which result in increase of buildings, vehicles, factories, urban waste sewage water and smoke. Urban centers when combined with industrial sectors become more hazardous from the standpoint of view of environmental degradation and pollution. A pollution dome and heat zones are created in the urban centers. This high rate of rapid urbanization in the developing countries will reduce the area of rural domain and loose the rural character and agricultural land in the future. Thus, the percentage of urban population may overtake that of rural population within a few decades in the developing countries of the world.

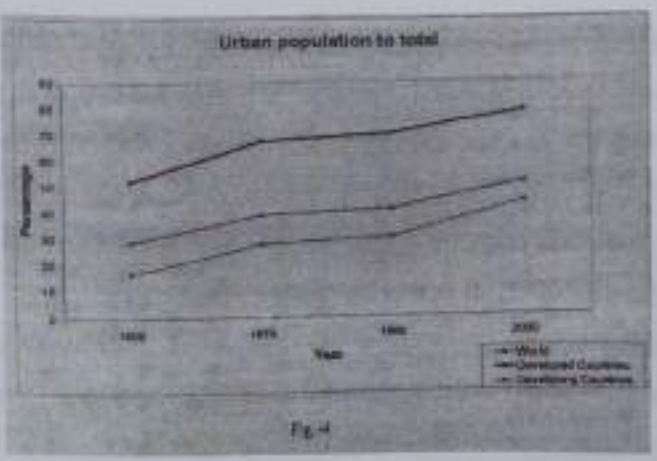

Fig.-4

Traditional Cultivation:

In mountainous area in many developing countries shifting cultivation is still practiced. According to FAO, these economic activities are dominated in closed forest and it is the most important determinant of forest destruction periodically. Illicit timbers extraction and land specialization are common under shifting cultivation. Primarily, primitive tribes in the mountainous areas have greatly practiced this type of cultivation. All these areas are dominated by the high percentage of scheduled tribes whose main occupation is shifting cultivation. Some non-tribal population is also some times involved in shifting cultivation (Spencer, 1966). These tribal people are pushed out for political, economic and religious reasons (Weber, 1969). Shifting cultivation is sporadically and implicitly allowing the perennial growth of secondary forests in agricultural lands, through following the cultivated lands for the period of five years (Saucer, 1956). This cultivation had led to accelerated soil erosion and landslides. A sizeable amount of forestlands had under the plantation crops in developing countries. The cultivators have been confronted, influenced and ultimately oppressed by the Spontaneous Settlers in India.

Expansion for Human Settlements:

Most of the present settlements were on the forest. With the growth of population and the development of industries, the forest comes under the impact of internal as well as external powers. Europeans forcibly took control of many developing countries and they cleared as much forest lands as possible and as fast as possible. In this process, expansion of agricultural

lands became more successful in grabbing large proportion of lands (Warmer, F. 1982). Statistics reveal that many landowners controlled a huge amount of lands previously owned by forest department by any means. All these substantiate the dominant role in the process of deforestation. Increasing landlessness and marginalization of farmers of one hand and lack of agricultural support facilities of the other hand compelled the people to intensify land use and to increase live stocks and encroach into the forest. Majority of people (82%) in developing countries used firewood for domestic purposes. Whereas, the corresponding figures is only 16% in the developed countries. The degree of dependency of fire wood in developing countries is increasing whereas that is decreasing in the developed countries due to supply of alternative sources of energy. A large part of forests of the developing countries are also destroyed for construction of roads, bridges, power plants and other purposes.

Although, the British started planned settlement programmes but it got momentum until Second World War. Many towns and settlements in the hill areas in most developing countries of the world had grown up by clearing the forests and many roads and railway lines had been set up to link up these settlements and towns with other places of the area and out side the area. Thus, a large area of forestlands was eliminated for the planned settlements in the past.

Growth of Livestock Population:

Due to poverty in the developing countries many people rear livestock for additional income in the family. So, livestock rearing is the integral part of the peasant economy in many developing countries. It exerted high pressure on forests and forest resources. Despite random killing, the number of live stock population is increasing steadily. In many developing countries, increase in population has a direct effect on increase of live stock population. In rural areas, livestock grazing and collection of fodder are major causes for destroying and degrading the forests. Highest destruction of forests occurs when the animal population exceeds the carrying capacity of the grasslands. As the lands of the rural areas are fragmented, income from the agriculture reduces so the farmers are dependent on alternative income such as livestock rearing which ultimately exerted pressure on the forests. Moreover, due to high price of dairy products, the small and marginal farmers are tried to increase their livestock population for high income and these people are solely depend on forests for fodder for livestock. So it is a low invested income in the rural areas. Developing countries share a large proportion of livestock of the world's total. The number of grazing animals is increasing manifolds year by year. So, demand for fodder and forage is also increasing and consequently, the pressure on forests is accelerated

considerably. The consequence of overgrazing on forests is leading to deforestation and degradation.

ENVIRONMENAL MANAGEMENT:

In the context of grim environment of deprivation in the developing countries, appropriate strategies for poverty alleviation are essential. Economic growth by itself will not automatically alleviate poverty. The development process with high growth strategy can bypass significant sections of the community. Even growth strategy can work to make disadvantaged vulnerable groups worse off. Therefore development strategies should be undertaken specially for the improvement of the living standard of the poor community. This should also be done by involving them into the productive process so that poverty alleviation strategy also brings contribution to output.

Thus achievement of high growth does not necessarily mean alleviation of poverty. At the same time, it should also be emphasized that the long runs alleviation of poverty without generating resources. Exiting growth process is also associated with environmental degradation. More air pollution and global warming are created by more production of steel and autos. Production of more newspapers and construction of more houses lead to the felling of trees. For production of more food, more pesticides should be utilized. Increased output in the petrochemical industry is accompanied by a rise to toxic substances.

Thus, economic growth pollutes and damages the environment. Development and lack of development both can contribute to environmental degradation. In order to protect environment, poverty should be alleviated and development process should also pursue in such a manner that in no way it does destroy or degrade environment.

Settled agriculture, the diversion of watercourses, the extraction of minerals, the emission of heat and noxious gases into atmosphere, deforestation for commercial purposes are all examples of intervention of the people in the process of development. Soil erosion and other form of land degradation is the result of inappropriate land use and land management. Water logging soil salinity is also due to faulty management of irrigation of water. Disasters like droughts, floods and cyclones are also associated with management of developmental practices. The human interventions create threat to the life support systems both locally and globally. At a minimum, sustainable development must not endanger the natural systems that support life of the earth, the atmosphere, the water, the soils and living beings.

Developmental Strategies:

As most of the people in developing countries live in backward areas, therefore a distinction of sustainability should be found in the interest of the large majority of the people of the region who share a broadly similar level of economic and technological development. Because of limited supply of resources in these poor countries, development must be with optimum utilization of resources. Development should be equitable otherwise disparities lead to their own logic of resource destruction. It must be environmentally sound, eco-friendly and it must fulfill desire of the people with the resources available to them. In order to achieve sustainable development, actions should be taken to improve equity, establish environmental harmony conserve resources properly. Therefore, development process should be attempted in a decentralized and coherent manner to provide basic human needs with adequate environmental values. Environment Impact Assessment (EIA) is one of the tools for reduction of environmental degradation in any region of the world. In the developing countries, data for Environment Impact Assessment is not always available. The data those are available are scanty and unreliable. So, management on the basis of these data is sometimes not successful in reducing environmental degradation in the developing countries. So proper data bank is urgently necessary to formulate management strategy in the region of environmental crisis.

CONCLUSION

Environmental degradation is most common in developing countries of the world. This is increasing with an increase of population and random use of natural resources by the people of the region. Other factors for environmental degradation are poverty and lack of regeneration of natural resources. From the discussion, it can be concluded that the forest area in the developing countries is declining at faster rate though the regeneration of forest is going on side by side. In developing countries, majority of the people is living in the rural areas and most of them are living below subsistence level so they are partly depended on forest resources to maintain their livelihood. Illegal felling and stealing of forest produce are common in many developing countries and these will continue till the gap between the supply of food for men and fodder for animals has reduced. The on-going large-scale rural-urban migration and subsequently, the mushrooming of squatter settlements are likely to increase the demand for firewood and timber in urban areas. The scarcity of forest produce in respect of high demand affects the shelter and living conditions of the people in both rural and urban areas. High price

of timber and forest produce compelled the people to live in unhealthy sanitation in rural areas and slums in the urban areas. Day by day, supply of forest produce is becoming less and less due to intensive collection of forest produce for high growth of population. As a result, the rate of deforestation is considerably higher in high-forested areas compared to less-forested parts of the developing countries of the world. Moreover, due to high rate of growth of live stocks population in many developing countries, the forest lands in the hills foothills are declining and overgrazing thus, directly help soil erosion and landslides which are more common and faster in less vegetative areas of the hills. There are many other ill affects of deforestation like sedimentation in the riverbeds, on agricultural lands, flash floods, and decrease in rainfall and crop damage in the developing countries. Deforestation is also related to ecology of the region. There is a high gap between ecology and environment in the developing countries. So environmental management and development in the region can reduce the gap between them.

Various plans and programmes have been introduced in different regions of the developing countries to conserve the forest and increase the forest produce. Aforestation, social forestry and plantation of quick producing species are some of the programmes those involve the common people. All these programmes have been introduced in different developing countries and the people are getting their benefits. But the trees in the Protected Forests could not be conserving due to illegal felling or stealing of mature or immature trees. So, mass awareness programmes are necessary for conserving and protection the forests and environment. Recently, a number of Joint Forest Management Committees (JFM) and People's participation in Forest Management (PFM) has been introduced in many developing countries and there is a high success in these schemes. Other measures to tackle environmental problems in the developing countries are i) by developing of pollution free technology and ii) reduction in the exploitation of natural resources, iii)to replenish the degraded forest by aforestation, iv) to limit the use of chemical fertilizers, v) to limit the production of materials those release ozone gas, vi) to stop the production of nuclear weapons and viii) to control the agricultural lands to degrade. Thus, the forest wealth of the developing countries can be restored and conserve for the future generation.

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Human Dimensions of Environmental Issues in the Perspective of Darjeeling, the Queen of Hills

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(Abridged version of the lecture)

Major Campbell established Darjeeling in 1834. He compared the beauty of Darjeeling in the midst of deep forests to that of his mother land. At this moment the population density is 10,000 per square kilometer, the highest for any hill-town in the world. Add to this – a 30,000 per square kilometer for the tourists in season times. Then one can imagine the built up area (a concrete jungle) and the solid waste to be managed. One can only wonder if Campbell imagined of this Darjeeling!

Land slide is so frequent these days-both on way to Darjeeling and in and around Darjeeling! Previous records indicate that the catastrophic land-slide was normally triggered by 25mm rain. Now even a rain fall of 1mm can lead to the same level of disaster. Yes, physical factors are there. But, human intervention in the wrong and careless direction has multiplied the degradation.

Trees are being cut indiscriminately. People take some advantage of loop-holes of existing laws as well. For example, they cut all the branches of a tree at the dark of night. When the tree is dead, the law says, it is no one's property. Now they cut the trunk and sell at convenient prices. As a result land slides have become more frequent.

Next, water scarcity during summer has become a regular problem. This has come into existence as a result of the multiplication of two factors. One of them is the increase of population density beyond the tolerable limit and the second one is the decrease in number of natural water sources. This crisis generates a big business and disaster to poor families.

The landslides affect the life on the plains also. The landslides lead to silts which the rivers carry. When it comes on the plains the velocity of water decreases considerably. The silts gradually settle down. The river bed goes up. In the rainy seasons flood become inevitable.

It is true that the government should take some initiative. It is more important that the people should be educated about environment in the perspective of its philosophy, science and technology.

পরিবেশ সংরক্ষণ - আশা ও নিরাশা

অধ্যাপক শঙ্কর চক্রবর্তী

সভাপতি, পশ্চিমবঙ্গ বিজ্ঞান মঞ্চ

(বক্তৃতার সংক্ষিপ্তরূপ)

পরিবেশ সংরক্ষণ সম্পর্কে গান্ধিজীর বিখ্যাত একটি মন্তব্যের উল্লেখ করা যায় যেখানে তিনি বলেছেন যে 'পৃথিবীতে যা আছে তা প্রত্যেকের প্রয়োজন মিটাবার জন্য যথেষ্ট হলেও প্রত্যেকের লালসা মিটাবার জন্য যথেষ্ট নয়।' অর্থাৎ পরিবেশ সংরক্ষণে আধুনিক বৈজ্ঞানিক পদ্ধতি কার্যকরী ভূমিকা গ্রহন করলেও এক্ষেত্রে সবচাইতে বেশী গুরুত্বপূর্ণ ভূমিকা রয়েছে মানুষের সচেতনতা এবং আত্মসংযম-এর।

যেমন কিছু কিছু গ্রামাঞ্চলে জনসংখ্যা বৃদ্ধি পাওয়ার ক্ষেত্রে স্থানীয় প্রয়োজন বড়ো হয়ে দেখা দেয়। জমিতে কাজ করার জন্য বেশী লোক দরকার। নিজের সন্তান এই বিষয়ে প্রায় বিনাপয়সায় অংশ গ্রহন করতে পারে। অধিক সন্তান এখানে পারিবারিক সচ্ছলতার প্রতীক। স্ত্রীর স্বাস্থ্যের ক্রম-অবনতি হলেও পরিবার কর্তা মোটেই বিচলিত হন না।

উন্নত দেশের ক্ষেত্রে যা' প্রযোজ্য, উন্নয়নশীল দেশের ক্ষেত্রে তা প্রযোজ্য নয় - এইরকম বিভেদনীতি ও পরিবেশকে সংকটে ফেলে দেয়। আমেরিকা উন্নত দেশ। সেখানকার মানুষেরা তাদের দেশের পরিবেশ সম্পর্কে সচেতন। কিন্তু তাঁরা ভিয়েতনামের পরিবেশ নিয়ে মোটেই ভাবিত নন। অথচ পৃথিবীতো একটাই। পরিবেশ দূষণ তো রাজনৈতিক সীমারেখা মানে না।

আমেরিকার বর্জ্যপদার্থ — ওষুধ, যন্ত্রাংশ-ইত্যাদির রূপ নিয়ে ভারতে এসে জনসমুদ্রে মিশে যাচ্ছে। ঠেকাবার উপায় নেই। জনগনের চাহিদা ভালো-মন্দের বিচার লোপ করে দিয়েছে।

গ্রামাঞ্চলে বেশীরভাগ মানুষ মাঠে মলত্যাগ করেন। পরিবেশের অপরিসীম ক্ষতি হয়। বিভিন্ন সংগঠন অক্লান্ত পরিশ্রম করে বহু মানুষকে বোঝাতে পেরেছেন। সরকারী স্তর থেকে সাহায্যের হাত এগিয়ে এসেছে। তবুও পরিপূর্ণ সচেতনতা আজও অধরা থেকে গেছে।

জলসংকট। রাজস্থানে ঘুম থেকে উঠেই মহিলাদেরকে মাথায় হাঁড়ি নিয়ে বাড়ী থেকে অনেক দূরে যেতে হয় জলের সন্ধানে। এই কাজটি তাদের কাছে এতোই গুরুত্বপূর্ণ যে বৎপরিবারে বিয়ের আগে মহিলাদেরকে কাঁচের টুকরোর উপরে জলভর্তি হাঁড়ি নিয়ে নেচে পরীক্ষা দিতে হয়। বিশেষজ্ঞদের মতে খুবই দ্রুত দিল্লী এবং মাদ্রাজ শহরে পানযোগ্য জলের সন্ধান শেষ হয়ে আসছে। প্রতিকারের জন্য প্রয়োজন — সচেতনতা, সংঘবদ্ধ প্রচেষ্টা এবং বৈজ্ঞানিক দৃষ্টিভঙ্গী, অনেক সাফল্য এসেছে। রাজস্থানে রাজেন্দ্র সিং এবং তাঁর সহযোগি ছাত্ররা সফল হয়েছেন। কোলকাতার বানতলা প্রোজেক্ট দেশ ও বিদেশের কাছে দৃষ্টান্ত স্বরূপ হয়েছে।

পরিশেষে বলতেই হয়, পরিবেশ রক্ষার সবচাইতে গুরুত্বপূর্ণ বিষয় — শিশুর স্বাস্থ্য এবং মায়ের স্বাস্থ্যের পক্ষে অনুকূল পরিবেশ তৈরী করা।

Complex Environmental Issues And Future Strategy

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The first decade of the new millennium will test the survival skills of man. The dinosaurs roamed the earth for 65 million years and then they just vanished due to some natural catastrophe. Humanity, which has been around five million years and then yet be victim of another catastrophe. Only this one will not be natural but man made. It will require the best minds and the best technology to pull back humanity from its roller coaster ride to certain doom.

We have already entered into a new millennium with a mixed bag of spectacular achievements and some of the most horrendous and challenging problems. Spectacular advances in technology and science have resulted in a dramatic improvement in living standards. This has resulted in an explosive growth in population. No century can match the population growth of the one, which we have already left. At the dawn of the 20th century there were less than 2 billion people on earth, we left the century with six billion populations. The momentum created by the unprecented growth of the last half-century will carry us towards the seven billion-probably within the next 14 years. Nearly all these will occur in the less developed regions of the world.

The need for more space for living, growing food and for throwing the waste material generated by a rapidly urbanized population has put tremendous pressure on the environment. The consumption of natural resources by modern industrial economies remains very high-in the range of 45 metric tons to 85 metric tons per person annually when all materials (including soil erosion, wastes and other ancillary items) are counted. It currently requires about 300 kg of natural resources to generate $ 100 of income of the world's most advanced economies.Given the size of these economies, this volume of materials represents a truly massive scale of environmental alteration.

The changes to the natural ecosystems, as a result of this massive consumption, are happening on a large scale than ever before, involving entire landscape. The scale of this changes as well as the increasing intensity of industrial and agricultural processes, are inducing changes in the global system and cycle – such as the atmosphere and the nitrogen cycle – under pin the functioning of the ecosystems. These anthropogenic activities led to what is known as 'global change', and have become a cause for worry by the international scientific community. The term 'global change' is often confused with 'climate change'. Climate change can be viewed from two different perspectives – one, natural phenomenon, caused through geological events, and as such is beyond human control, two, human-induced climate change brought about through industrial emissions into the atmosphere and the consequent changes in the atmospheric elemental composition. Given the will to take collective global action, the human-induced climate change is reversible may be over the next 50 years or so. There are other changes that are more difficult to reverse. Land-use linked land-cover changes leading to land degradation and desertification is a global phenomenon which can be reversed only at immense economic cost and which many developing nations can ill afford, from a short-term perspective. Biological invasion, the colonization by exotic species in an alien environment, is a phenomenon, which has played havoc in the past and still continues to do so: the water hyacinths in our water bodies or lantana invasion on the land are examples of such and invasion of India. With the introduction of technologies for rapid and mass transport of men and materials, the problem of biological invasion is becoming acute. This again is difficult to be controlled, once it has occurred. Linked to all this is biodiversity depletion; another serious global change issue that is totally irreversible. Biodiversity, once lost cannot be recovered at all, as we see from the accelerated large-scale human-induced extinction of species.

The concept of sustainable development, first articulated by the World Commission on Environment and Development, 1987, through the now well-known Brandtland report entitled *Our Common Future* reveals about a sharp shift in our thinking on the concept of economic development, which had assumed that natural resources are inexhaustible and are

available to be exploited for human welfare. Sustainable development is now seen as that process of development which meets 'the needs of the present generation without compromising the ability of future generations to meet their own needs'.

'Global change' has triggered this shift in paradigm on economic development linked to sustainable natural resource management. Depending upon the kind of 'global change' issues with which the society is currently trying to grapple with, the problem of sustainability assumes different meanings. The issues to be resolved- such as global warming because of greenhouse gas emissions, acidification of soil and water, drastic decline in the quality of air, soil and water, reckless exploitation of natural resources stored in the soil through mining activities, drastic changes in land use and land cover through over-exploitation of natural resources leading to desertification of landscapes, associated rapid depletion of biodiversity, etc. – all demand a whole variety of additional pathways for development. Further, depending upon the disciplinary emphasis of the individual/organization concerned with developmental issues, sustainability assumes different meanings. What seem to be emerging now is that the issues relevant to conservation of natural resources have to be addressed differently, depending upon the ecological, social, economic and cultural framework in which one is operating.

FIVE CORE GLOBAL PROBLEMS STILL STAND OUT IN THE WAY OF ACHIEVING A SUSTAINABLE WORLD.

- ***Human Induced Climatic Change.***
- ***Loss of Biodiversity.***
- ***Expanding Human Population and Reducing Congestion Level.***
- ***Environmental Insecurities.***
- ***Cost of Environmental Degradation.***

And at last to reconcile the conceptual confrontation between industrial development and environmental protection, economists must internalize and integrate the cost of environmental damages into the concept of economic productivity. In other words, economic logic needs to be conditioned by environmental ethics.

WATER POLLUTION
A TREMENDOUS THREAT TO LIFE- GET RID OFF

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ABSTRACT : -

Life had come only at the lap of water about thirty billion years of our beloved planet, i.e. Earth. Life exists on this Earth for about last twenty billion years. So it says, "No Water means no life." As we are alone not only on earth but also in Universe. We have to protect ourselves with its total bio – diversity by means of our well equipped knowledge, wisdom and activities. Now, we are at the age of twenty first century with an ultra-modern scientific technologies also with sixty billion of human population. This needs an utmost care from the core of our heart to protect water i.e. its sources, its conservation, its preservation and its minimum pollution with such a knowledge that our beautiful planet is not only for homosapience-sapience, but for all living micro organism, plants and other animals and even for non-living substances like ozone layer which protects life on earth.

Therefore, we have to develop consciousness, i.e. awareness through activities, through campaigning, through curriculum in every sphere of society from home to field, from agriculture to industry, from down trodden to multibillionaire, and also from a little child to aged, to maintain the environment in a beautiful harmony with sustainable development in biosphere and physical environment.

Water pollution, both in surface and underground are in acute threatening due to urbanization, industrialization and over cultivation with a geometric progress through food chain at a rocket speed. My discussion will be confined on water pollution, its sources, measures and our activities in education curriculum and at day to day life for each and everyone to protect water from all kinds of hazards for our existence or we have to pay life for a lack of drop of safe water.

INTRODUCTION : -

We all know that after the Big-Bang the whole universe had taken a new birth with huge numbers of stars, planets and all kinds of different masses about sixty billion years ago. There after, a gradual change of the universe took place, the position of the earth with respect

to the sun was such that water formed about thirty billion years ago followed by a gradual creation of life system. This type of evolution theory predicts the creation of life on earth about twenty billon years ago. So it could be said, "No water means no life". So after a long path traversing the humane society is formed just about 1.2 billon years ago of the completion of Jurassic era. We know now that the human population on the earth is about seventy billons. But these huge populations needs huge amount of basic needs i.e. foods, shelter, and other substances. More the population, more the all kind of requirements. Therefore, plants and forests are first - target to give the places to people. But clean forest operation is a silent steps to death, this basic information though is very clear to human being, yet it could not be possible to protect the natural sources without destroying the total resources. The three basic components of earth environment i.e. water, air and soil are gradually polluted by the greediness of human society. They could never think that life would be no more on earth or in Universe if we destroy our all resources by polluting them hurriedly.

The three physical or abiotic components of environments are air, water and soil and they are very much inter-related. The biotic components of these three physical components are very much dependent on resources supplied by them in such a manner that any one of them if polluted by any way the whole life system may get disrupted. The pollution of these natural resources is done by the human society due to their ignorance and unscientific attitude towards environment and life full of greediness.

Among the three components, water is to some extent different because of its distribution in other two components where life prevails. The aerial microbes and life and underground soil life system is also very much dependent on pure water. So water is the symbol of life. Due to tremendous pollution in water components by different ways lead the life to a dangerous condition. We, the human being are virulent destructors of the quality of water due to aggressive attitudes as well as peculiar temperament of modern civilization. But we have to remove this ignorance by developing consciousness i.e. awareness through activities, continuous campaign and also through activities-based curriculum in every sphere of society from home to field, from agriculture to industry and from downtrodden to multibillionaire, and also from a child to aged.

Therefore this discussion will be only on water component and its pollution and remedies. To protect water from all kinds of hazards, or otherwise we shall have to pay lives for scarcity of pure and safe water.

DISCUSSION : -

Now our discussion will be about water component on earth and its various kinds of pollution and measures to get rid of pollution to get pure water for the existence of life on earth.

We know that the total surface area of the earth is 50,000 million hectare, 20% of which is land area and the rest 80% is covered by water. Total estimated water on earth is 1011 million cubic kilometers (mckms) of which 97% i.e. 986 mckms is salt water either in ocean or lakes and the rest (about 3 mckms) of slot water that is buried underground. The remaining 2.5% of total water is in frozen state in the polar ice cap and in glaciers. Therefore, 0.5% of total water that is only available as free- water on the earth provides a vital role for the existence of life-cycle on the earth. This water estimated as 33400 M^3. So imagine what a small amount of water is available on the earth for us. But that is also more than sufficient if it is judiciously used by human being of each country on the earth.

But now this very little quality of available water is under tremendous threat due to various kinds of agencies which may be called as sources of pollution. Water pollution by natural way is not so important because nature has some cyclic process which controls itself by natural way. But with development of science and technology urbanization and industrialization run side by side very rapidly but this type of growth around the countries needs deforestation and de-cultivation of lands which are the primary causes of land erosion and water pollution due to toxic material and water on the land. But the huge sources of surface water pollution is due to direct drainage of sewage water from urban and semi – urban areas, municipalities waste water, industrial waste water, industrial waste effluents, chemicals used either in agricultural purposes or infrastructure development, cargo ship wastes, mine wastes and many other natural

and man made activities. These are the different sources of water pollution by which surface water is polluted.

Besides these other sources of surface water pollution are soil erosion, volcanic eruption, land slides, coastal and cliff erosion, floods. Decomposition of plants and animals are the natural sources of surface water pollution. These types of natural sources are of little bit slower pollutants than man made sources.

Now, we shall discuss why this type of water pollution is so tremendous for acquatic & non-acquatic life system. Generally it is observed that each & every life system has a particular tolerable limit for different elements and chemicals. If, by any way, these tolerable limit is exceeded, then, it will be very fatal for that life system not only for that generation but also for generation after generation. As for example, minamalta decease in Japan, that occurs due to mercury pollution. Arsenicosis in West Bengal and Bangladesh is just like an epidemic to human society due to arsenic pollution in under ground water. Fluorisis in Birbhum district of West Bengal as well as few districts of Jharkhand is another example of fluoride pollution in under ground water. There are many other examples regarding these surface water pollution due to chromium lead, nickel, cadmium etc. which are generally present in the industrial run-off and causes different kinds of diseases not only in human society but also for other animal. Different organic chemicals are very much carcinogen. Their lethal dose is very low. Aquatic life system is getting a tremendous threat due to these kind of organo metallic compounds which are very much used in different industries. We already know that chemicals used like D.D.T. and gamacxine as pesticides are very non-biodegradable and harmful for different biological system. So, in this way we can state a thousands of examples of water pollution and their horrible effects on life system, which will ultimately distract the total life cycle and biodiversities on earth.

MEASURE : -

So, the question arises what next we have to do. Now, the global scenario is such that the urbanization and industrialization could not be stopped or controlled due to rat race of the economic growth among the countries. A meagre number of first and second world countries are improving out-sourcing a huge number of third world countries where industrialization and urbanization show their economic growth for millions of population below poverty level population and followed by pollution. We know that population, poverty and pollution occur simultaneously. This pollution is due to innocence of the illiterate and clevery of educated rich countries. Third world countries are very much engaged to eradicate poverty for which human work is needed and thereby industrialization with urbanization is growing rapidly. The vicious circle of population pollution and poverty is running very fast and these will bring our early destruction or perish.

It is also said that 'away from nature' causes 'away from health'. So pollution will bring an unhealthy situation not only for human being but also for all other life system. To get rid off from these hazards we need education for all. Minimum level of education with awareness about environment, its components, its nurture and its preservation for better life and longest existence is the prime need. Common knowledge about protection of water, air and soil will bring our hazards-free life on the earth with full protection of bio-diversities which is the very basis of ecosystem with life-cycle on earth.

We have to protect ourselves by implementing large-scale awareness camps regarding environment protection. Awareness programme is such that it should be continuous in process and full of activity, mentioning the horrible future of our world. If the awareness camp is not associated with life and need of the people it would have little effect. Sciences and art of living system for its existence should depend upon the re-usable, recyclic, sustainable use of each and every resources that are available in the local environment. Sustainable use of resource will be possible if government policies are right and must be followed by countrymen irrespective of any biasness.

CONCLUSION : -

Government policies should be successful in every corner of country following the bio-diversity of local environment. Water consumption should be controlled in such a manner that use of rain-water must be increased by water harvesting in each locality. Rain water is the only natural recyclic source of pure water which is free from all kind pollution except acid rain. Acid rain problem may be removed by proper control over different industries. Water pollution, mainly surface water pollution, could be removed by each and every people if we change our curriculum from cognitive domain to psychomotor domain, where discussion with active participation of each member of the society will help to protect water pollution and thereby reduce wasting surface water.

Now, curriculum design in all over our country is basically collection of knowledge only without adding any activity, which should be related to eco-friendly attitude and activities. So, designing of curriculum should be started at very grass root level and informal & non formal way. Only knowledge and information will not be able to ensure our existence. Student, teacher & local people should be involved with activities. School community should take the project with public so that the slogan includes 'clean environment, green environment and bring rain water for existence of life with pure and safe water, air and soil.'

Increasing Population And Growing Water Crisis in India : Socio Ecological Perspective

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Abstract :

Water is the most vital resources for the existence of life in earth. It is indispensable for ecosystems and forms an essential element in the development of economic activities. No other natural resources has had such an overwhelming influence on human history. According to World Health Organisation less than one percent of the world's fresh water or 0.007% of all the water on earth is readily available for human world consumption. As the human population increases the demand on fresh water resources will continue to grow. Water has become a scarce commodity in India due to population exploision, unplanned urbanization, unrestricted exploitation of ground water, mushroom growth of industries etc. India account for 2.2% of the global land and 6% of the world water resource but has to support 16% of the world population. The comparative per capital availability of water of some major countries shows that India has one of the lowest per capita availability of water. United nations population projections indicate that India will be among 34 countries of the world which are likely to face severe water shortage by the year 2025. The Government of India has recognized access to safe and adequate drinking water for community as one of the major thrust area. Shortage is not just an urban problem but is in fact worse in rural India. In a report presented at All India conference of state Ministers of Rural Drinking water supply it is revealed that if the annual per capita availability of fresh water in India falls to 1000 cubic metres it could seriously affect the health and economic activity of the entire country. In agricultural sector competitive demand of irrigation, unrestricted explotation of ground water, inadequate sanitation, inadequate infrastructural and financial support and poor level of participation causes several problems like shortage of safe drinking water, microbial contamination of water and food, several deaseses like gastroenteritis, diarrhoea, dysentery, cholera enteric fever, arsenic pollution etc. Water is now the biggest problem in urban India also. As many as 203 of the 401 class-II towns in India get less than 100 liters of water per person per day. Over 200 million people are at risk as eight river basin are water deficit, it also threatens the country's food security. So, water crisis in rural and urban India is not merely an ecological problem but it creates socio-economic problem also. Therefore in order to ensure the availability of sufficient quantity of good quality water it becomes almost imperative in modern society to plan and build suitable water supply scheme which may provide portable water to the various sections of community in accordance with their demands and requirements. The greater need is to redefine and redesign the water demand.

Water is a chemical compound and may occur in a liquid form or in a solid or a gaseous form. All these three forms of water are extremely useful to man. It has been estimated that two third of human body is constituted of water. But not only India the whole world is now facing a fresh water crisis. The world's thirst for water is likely to become one of the most pressing resource issues of the 21st century. Global water consumption rose six fold between 1990-1995 more than double the rate of population growth and continues to grow rapidly as agricultural, domestic and institutional demand increases people already use over half the world's accessible fresh water and may use nearly three quarters by 2025. If per capita consumption of water resource continue to rise at its current rate humankind could be using over 90% at all available fresh water within 25 years leaving just 10% for the rest of the world's species. In other words 1.5 billion people lack ready access to drinking water and if current consumption patterns continue at least 3.5 billion people, nearly half the world's projected population, will live in water stressed river basins in just 20 years. On top of this contamination denies some 3.3 billion people access to clean water and 2.5 billion people have no water sanitation services. In developing countries an estimated 90% of waste water is discharged without treatment into rivers and streams. Each year there are about 250 million cases of water related diseases with some 5 to 10 million deaths. It is not only people who are threatened by water shortage and pollution, fresh water ecosystems which harbour the world's greatest concentration of species are among the most vulnerable on Earth. Half the world's wet lands have been destroyed in the last hundred years. Two fifths of the world's fish are fresh water species and of these 20% are threatened, endangered or have become extinct in recent decades.

INDIAN SCENARIO :

United Nations population projection indicate that India will be among 34 countries of the world which are likely to face severe water shortage by the year 2050. India accounts for 2.2% of Global land and 6% of the world water resource but has to support 17% of the world population. The amount of water available per person in India has decreased steadily from 3450 cm in 1951 to 1250 cm in 1999. According to the ministry of water Resources it is expected to decrease further to 760 cm per person in 2050. The per capita availability of water in major countries given below shows that India has one of the lowest per capita availability of water.

Table –I

Per capita Availability of water in – 9 major countries

SI No.	Name of the country	Availability of water percapita in 1000 m^3
(1)	Canada	110.0
(2)	Norway	091.7
(3)	Brazil	043.2
(4)	Sweden	023.4
(5)	Australia	021.8
(6)	U.S.A	010.0
(7)	France	004.3
(8)	China	002.8
(9)	India	002.1

Water is scarce even for drinking purpose. The drought conditions in several parts of the country like Gaujrat, Rajastan, Orrisa, Andrapradesh are unfortunately on the rise. Presently six of India's 20 major river basins already fall into water scarce category. By the year 2025 five more river basins are feared to be water scare. Even Brahmaputra, Barak and West flowing rivers will be water deficient.

Water scarcity in India is caused by mainly population growth, environmental change and degradation and unequal distribution of water resources and mismanagement in water policy.

Population Growth and Demand of Water

India is the second largest country after China in terms of population. The Indians numbered about 10.88 crore in 2003 accounting for nearly 17% of the world's population. The following table shows rapid growth of population during last few deeades.

Table – II

Population growth from 1921-2001

Year	Density of population and Decadal growth (per sq. km) rate	Total population (crore)
1921	81+11.00	25.13
1931	90+14.22	27.90
1991	103+13.31	31.87
1951	117+21.51	36.11
1961	142+24.80	43.92
1971	127+24.66	54.82
1081	216+24.07	68.33
1991	267+23.25	84.63
2001	324+21.34	102.74

Source-Census Data

Population explosion leads to rapid growth of urbanization, unrestricted and indiscriminate exploitation of ground water, forest resources and traditional sources of surface water. Moreover, for competitive demand of agriculture new HYV technologies and mushroom growth of industries demand for fresh water is increasing very high. India's population is expected to touch 1,650 million by 2050 which means the demands for water will rise from 634 bcm (now) to 1,447 bcm. Nearly two thirds of this will be for irrigation as India would need to double its food production from the current 200 million metric tonne to 450 million. The International Food policy Research Institute projects that India will steer its water demand by 50% over the next 20 years. Most of this increase will go to industrial and domestic users, — each projected to quadruplicate its current demand. Further the growing concentration of people in metropolis and class I cities in India creates another major problem like shortage of safe drinking water. As for example the growth rate in Siliguri during last 60 yr (1931-1991) is 64.3%. The recent water crisis in Kalimpong and Darjeeling is also due to huge population growth in those areas. Recently (7th April 2005) GNLF ward councilors along with chairman submitted a memorandum to the state minister –in –charge of public health minister highlighting the growing water crisis in town area.

They argued that due to huge population growth (6500 and 30,000 students from other states) the minimum requirement for Kalimpong is 1000,000 gallon per day that means 50 litters per head per day but only 3 lakh gallon is being released daily which comes to a maximum of 10 litters per head According to ward councilor of Kalimpong municipality, "it is most unfortunate that the present water crisis has forced most residents to buy water at the rate of Rs 100 for 500 litres and the worst sufferers are women and children below poverty line". The following table shows the general water requirement for different uses in India as projected to the year 2010, 2025, 2050 respectively.

Table – III

Water Requirement of Different uses in India.

Sl No.	Uses	Water Requirement (Quantity Km2)			
		1997-98	2010	2025	2050
			Surface water		
(1)	Irrigation	318	339	366	463
(2)	Domestic	17	24	36	65
(3)	Industries	21	26	47	57
(4)	Power	7	15	26	56
			Ground Water		
(1)	Irrigation	218	245	344	-
(2)	Domestic	13	19	26	46
(3)	Industries	9	11	20	24
(4)	Power	2	4	7	14

Source- Yojana Feb – 2004/Vol 48/ p-32

In Urban area it is the duty of civic bodies to provide all communities with safe drinking water as also to plan for industrial and other needs. Water is required for the following uses :

Domestic : The use of water for drinking, bathing, watering of lawn and garden, air conditioning, flushing of toilets, livestock etc.

Institutional : Use of water in hospitals, educational institute, hotel and restaurants, hostels, cinema halls, offices, factories, Railway station. Bus stand etc.

Public Purpose : Water utilized in street sprinkling watering of public parks, display fountains and cascades, swimming pools and flushing of its sewers etc.

Fire Fighting : Water used in fighting fire meance in both rural and urban area.

Industrial and commercial : The water needs for different industries vary widely e.g. Automobile, Distillery fertilizer, Leather, Paper, Pertrolium Refinary Steel, Sugar, Textile, mines etc.

Apart from above substanlial quantity of water is lost due to waste through public hydrants and other users.

Due to rapid growth of urbanization and changing life style the demand for water, for above mentioned purposes in urban dwellers increases : India being an agrarian country depends a great deal on water for production of food and economic development while the availability of water solely depends on climatic factors.

Sources of Water :

Water is widely distributed in nature by two major sources.

(i) Surface water, (ii) Ground water

Surface water : The part of rain water which flows over the ground to feed rivers, brooks, streams, lakes, ponds etc is known at run-off or flow of water.

In general surface water is impure and become contaminated where the river flow through thickly populated and industrialized areas.

Ground water : Gravity and artesian springs, deep and shallow wells and infiltration galleries under sandy river beds with a good depth of sand are the common sources of ground water. Public water supplies from groundwater sources are economical as well as less complicated.

Unrestricted and excessive dependence on ground water

Over exploitation of ground water potential for irrigation and urban water supply schemes leads to water shortage and water stress in rural areas. For example tubewell depth have plunged tenfold to 1000ft across India. Six out of ten borewells dug in north Gjujrat, Sahra kutch region, yield no water even at a depth of 1200 ft. Ground water is a major contributor of many stages of the state and depends upwards to 50% of ground water while the all India average itself is 45.73%. The following table shows the states heavily dependence on ground water.

Table – IV

Dependence of ground water (Based on ultimate irrigation potential)

Sl.no.	Name of the state	Dependence on ground water %
1.	Manipur	61.09 %
2.	Uttar Pradesh	55.08 %
3.	Madhya Pradesh	54.27 %
4.	Jammu and Kashmir	52.13 %
5.	Tamil Nadu	51.19 %
6.	Punjab	48.80 %
	All India	45.78 %

Source : MOWR Annual report 2002-03

HEALTH RISKS :

Owing to the continue over exploitation of ground water the level of ground water has depleted alarmingly and fluoride content of water has been increasing in many part of India. Unrestricted exploitation of ground water has other manifestations. In west Bengal almost 5,00,000 people are attacked by arsenic through ground water. Increased salinity in Gurjrat, Haryana, Karnataka, Punjab, Rajastan and Tamilnadu as well as high fluoride levels in penisular India and western part of the country affected nearly 14 million people. Agenda "21" of the U.N. conference on Environment and Development (UNCED) mentioned an estimated 80% of all diseases in developing countries are from contaminated water. In India water borne disease such as gastroenteritis, diarrhea, dysentery, cholera, enteric fever prevails due to unsafe drinking water clubbed with poor environmental sanitation. In addition to biological contamination a variety of chemicals like fluoride, arsenic, nitrates and iron present in drinking water beyond permissible limit recommended by WHO. Diseases caused by microbial pathogens in drinking water are concentrated in the developing world and within the developing world among the poorer urban and rural house holds in the poor countries. Inadequate sanitation adds to the microbial contamination of drinking water and food leading to increased number of carriers and cases. The Nation wide survey of habitations completed in the year 1994 shows that over 43.5 million people living, in 1.42 lakh habitations are at health risk due to presence of excess fluoride, arsenic, salinity, iron and other chemicals including nutrients. Pesticides and insecticides contributed through agricultural run-off.

In India 85% of Rural water supply systems are based on ground water aquifers. The depletion of ground water had been identified as one of the major factors responsible for chemical deterioration of drinking water sources. Organic substances and pathogenes lead to increased health risks especially in riverside populations that consume raw river water. The problems are compounded where industrial wastes containing heavy metals or other toxic chemicals are discharged into rivers.

Water is the biggest crisis facing urban India due to population boom, changing life style and rapid growth of urbanization. A study of 12 major cities shows that while they require over 14,000 million liters of water a day they get only 10,000 million liters.

Table –V

REQUIREMENT AND SHORT FALL OF WATER IN 12 BIG CITIES

SI No.	Name of the cities	Requirement (million liters) per day	Short fall per day. (million liters) per day
1.	Delhi	3830	880
2.	Kolkata	2258	696
3.	Mumbai	4000	1030
4.	Chennei	300	105
5.	Lucknow	560	120
6.	Jaipur	349	313
7.	Bhopal	335	70
8.	Indore	318	134
9.	Jabalpur	239	945
10.	Viskepatnam	305	146
11.	Hyderabad	956	186
12.	Bangolore	840	135

Source – India Today June 9 2003

The ministry of water resources estimates that the demand for water in the top 35 cities is expected to double to 12,906 million cubic metres as the population of these cities starts up from 107 million to day to 202 million in 2021, while availability stays at 2001 levels. The result : over 200 million people become vulnerable water wars. The following fact shows

the growing crisis of water in urban India due to excessive population pressure, increasing demand and mismanagement of water supply.

(1) As many as 203 of the 401 class II towns in India get less than 100 litters of water per person per day.

(2) In Rajasthan 10 towns get water once in three days and 31 once in two days, 12 town get it from 200 km away.

(3) Delhi loses 30% or over 800 million liters a day through leakage in the 8300 km pipeline network. The percentage of leakage in Kolkata is 10% and Mumbai 24%.

(4) 66 million people in 200 districts have risk fluoride contamination and 15 million risk arsenic poisoning.

(5) Nearly 2 lakh square km land in eight states including Delhi, Gujrat, Punjab and Hariyana have inland salinity.

(6) Rapid pace of urbanization has led to the drying up of traditional ecofriendly water sources like tanks and lakes. In Bangalore for instance 181 of the 262 tanks have dired up and the biggest tanks has been converted into the "Kanteerave" Stadium. The erstwhile state Mysore had 25,000 tanks and lakes. Today there are only 10,000 lakes left.

SOCIOLOGICAL IMPLICATIONS :

Water Scarcity and poor quality of portable water is caused not only by environmental factors like nature of rainfall, type of soil, and other climatic factors but mostly by man made problem which are purely Sociological such as :

(1) Population explosion.

(2) Rapid and unpanned growth of urbainsation.

(3) Changing life style.

(4) Too much density of population in metropolis and class I and Class II cities due to migration.

(5) Growing industrial demand and no control over industrial waste.

(6) Uncoordinated development approach.

(7) Non involvement of community in project planning, development operation and maintenance activities.

(8) Poor sanitation and stereo type mindset.

(9) Inadequate project preparation.

(10) Inadequate institutional and legislatiore frame work.

(11) Consumeristic life style.

SOME CONCRETE EXAMPLES

(1) As per constitution water is essentially a state subject. The centre can plan, propose and fund a project but the execution has to be done at the state level. Most states tend to focus on the short term projects. Ground water was pushed as a solution as it was cheaper and quicker while storage and distribution projects were neglected.

(2) There was no checks to wasteful technology and pollution of water resources. So the industry is not obliged to reuse water and continues to be the biggest polluter along with pesticide fertilizer ridden discharge from field.

(3) A study by the urban development ministry on drinking water subsidy point out that while the average cost of delivering water to a metro home is Rs 15 per 1000 liter the consumer pay only Rs. 1.50 or 10% the cost of distributing water.

(4) Agriculture requires 90% of the nation's water But most major irrigation project are funded not by users but through budget allocations.

(5) For a country that wants to achieve 8% GDP growth and where 67% of the population is dependent on agriculture the investment in rural infrastructure is pityful. Investment in irrigation has dropped from 22.4% in the first plan to 6% in 2000. More important is the lack of a national crop pattern policy. So in the drought hit Marathwada farmer grow sugarcane and in the water scarce Couvery delta farmers produce paddy. Both are water- guzzling crops.

Government of India is fully aware of these problems and has recognized access to safe drinking water to community as one of the major thrust area.

The National water policy 2002 in its preamble says water is a prime natural resource, a basic human need and a natural asset. So planning, development and management of water resources need to be governed by national perspective. The policy underlines the need to put into practice traditional conservation methods like water harvesting including roof top rainwater harvesting so as to increase further the utilizable water resources, Paragraph 3.4 of the policy lays particular emphasis on water shed management through extensive soil conservation, catchments area treatment, preservation of forest, increasing the forest cover and construction of cheek dams. Government of India has also extended the sector reform package to all the district in the country through a national programme of drinking water programme called "Swajaldhara" in 2003.

But mere government intervention to solve this huge problem is not enough.

The following are the suggestions. It is necessary to (1) Bring water policy under one ministry including water resource, food, environment water management. There should be coordination among water supply agencies, public health departments, pollution control board, Geological survey, research institutes, colleges, universities and N.G.O action.

(2) Draw up a new crop pattern in tune with water availability. It is time India shifted from the concept of yield per hectare to yield per cubic meter of water. It is necessary to use rainwater, soil water, ground water, and run off water to increase production in rain fed areas.

(3) Introducing ecofriendly technology to meet increasing demand of water in rural as well as urban sector.

(4) Curtail exploitation of ground water and ensure roof water harvesting in cities and towns.

(5) Design demand to match the availability of water policies.

(6) Use pricing simply not to reduce subsidy but as a weapon for conservation of water. Levying commercial rates for water both in urban and rural area is a necessity not an option.

(7) Appropriate scientific and technical inputs, research and development outputs are put to use at the grassroots level for the benefit of society. Plan should be taken at micro level instead of macro level.

Above all a strong political will of government to frame appropriate water policy and implementation and active participation of people, conscience of water users to ulitize water judiciously are absolutely necessary for sustainable utilization of water.

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Sociological Impact of Migration on the Changing Pattern of Environmental at Natural Resource Base : A Case Study of English Bazar and Old Malda Urban Area, Dist. Malda (W.B.), India

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Abstract :

Historically the process of urbanization has been associated with idea of migration. The meaning of it is to go from one country or region to another especially repeatedly and in large groups. Certain birds are known as migratory birds because they move periodically from one region of climate to another.

While making a study on the two blocks of English Bazar and Old Malda in the district of Malda, we must take into account the geographical location on the banks of river Mahananda which has influenced and attracted different people from the Historical past to come and settle here. During the Hindus period the Hindu rulers had come down the river Ganga to establish their kingdom and carry on trade and commerce in this part of Bengal. Then again during the Muslim periods the Pathans and Moghul rulers and traders came down the same way and established their control in this area. Even in the recent times the adventurous members of the East India company came to this part of the country –the land of Gour and the adjoining areas to establish their controls and administration and business. After independence when the country was divided, Bengal was further partitioned into East and West. Many Muslims from Malda went to East Bengal and Hindus in large numbers came to the Indian side of Malda.

Mainly due to the changing pattern of migration, the utilization of all types of resources has reached its apex and thus the author here seeks to analyze the role of migrated people and their pattern of utilization, their social, economic and cultural activities which has in turn changed the present socio-economic scenario of this area.

DEFORESTATION : A Threat To Environment

A study in Jalpaiguri and Darjeeling District

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The Darjeeling and Jalpaiguri district is a region of wide variety of forest resources. Of late, this repository of natural wealth has been subjected to virtual plunder. During the last 150 years, about 70% of the forest area had been cleared by so called developmental processes. In consequences, the local ecosystem are loosing their resilience and regenerative capacity. Since the nineteenth century, the fact which become evident that forests cannot necessarily regenerate naturally. The forest is not capable of regenerating itself if greater number of trees are cut for use. Moreover selecting cutting of economically important species may cause significant degradation of the forest lands of the study area.

Extensive heedless deforestation invites catastrophic soil erosion and innumerable land slides in the hilly parts and devastating floods in the foot hills and plains during the monsoon months. During the last 100 years, over 1000 land slides were registered covering an area of over 1000 hector. More than 1000 lives were lost in addition to loss of property and environment. The situation has deteriorated further in recent years, the last two decades having witnessed the worst land slides on hill slopes and heaviest floods in the plains. The picture is just opposite during the non-monsoon months when paucity of water hinders the local people from reaping out any benefits out of the soils. The depletion of the broad-leafed trees such as the Oak in the Darjeeling Himalaya, which conserves rain water and then releases it gradually throughout the year in the from of spring have considerably reduced these natural resources of water which have met the villagers' need for hundred of years. In several villages of the hill, during the dry seasons the women cannot sleep restfully due to their anxiety to reach the springs early enough to collect the few drops that trickling. Man and trees are symbiotically related to each other. So the non-existence of one would certainly vanish the other.

The removal of forest has economic implication also. Existence of agricultural civilization of the Sub-Himalayan North Bengal is intimately connected with the forests. Thus, the removal of forest also threatens the existence of agricultural activities. A recent study reveals that in between 1993 and 1999, 850 hectares of good forest land was destroyed either by bank failure or by shifting river courses. Over two million trees were destroyed the market price of which are approximately 15,000 million rupees. In addition to this dolomite mining activities is also found to be responsible for the destruction of under growth rich biodiversity of this area. This also exerts detrimental effects on the wild life of the region.

The forest based industries which play a prominent role in the economic development of the study area are also showing a sign of stagnation. These industries consume enormous quantities of forest product and also provide employment opportunity to the local people. They are also facing an acute crisis from the deficiencies of raw materials. Moreover, unscientific and unplanned exploitation of forest resource have led to the establishment of a vicious cycle degradation, endangering the ecological balance and consequently hinders the economic development of the study area.

Future of forestry activities would be uncertain unless forest management is suitably redefined and made an integral part of the rural development. Attempts need to be made to manage the forest as renewable resource to cater the basic human needs and to ensure employment and income in the rural areas. It will also protect the already endangered environment from further degradation.

The present paper focuses on the following points:

- **Productive and protective function of forest**
- **Causes of deforestation**
- **Impact of deforestation on**
  - **a) Landslides;**
  - **b) Flood; and**
  - **c)W ood based industries**
- **Suggestions and Conclusion**

মনসান্টো বীজ — কৃষি ও জনস্বাস্থ্যের সম্ভাব্য বিপর্যয়

অধ্যাপক শান্তনু বসু
রাষ্ট্রবিজ্ঞান বিভাগ, চাঁচল কলেজ

জিন প্রযুক্তি কিংবা বায়োটেকনলজী যে নামেই ডাকা হোক, জিন প্রযুক্তি এমনই এক বিজ্ঞান যা ভবিষ্যতের দিন গুলোতেও থাকবে। আধুনিক বিজ্ঞানের এটা একটা বিস্ময়কর দিক। কিন্তু এই অগ্রগতিকে দুনিয়ার উন্নত দেশগুলো এই প্রযুক্তিকে নানা কায়দায় আত্মসাৎ করে চলেছে। মার্কিন দুনিয়ার গবেষণা সংস্থা, ও জেনেটিক্যাল মডিফায়েড (জি. এম) খাদ্য দ্রব্যাদি প্রস্তুতকারক সংস্থা আর্থিক লাভের হারকে সুউচ্চ পর্যায়ে নিয়ে যাবার অভিপ্রায়ে জি.এম. বীজ নিয়ে নানা ধরনের গবেষনা করে চলেছে। গোটা দুনিয়ার জৈব প্রযুক্তি গবেষনা ১৫ টি বৃহৎ কর্পোরেশনের হাতে আছে। যার মধ্যে ১৩ টিই মার্কিন দুনিয়ার। এই অধিপত্যবাদের বিষয়টিকে আতঙ্কের সঙ্গে খেয়াল করছে উন্নয়নশীল দেশের সাধারণ মানুষ। দুটো জিনিস তাদের আতঙ্ক বাড়িয়েছে। প্রথমতঃ মুষ্টিমেয় সংস্থাগুলো শুধু যে জিন প্রযুক্তিগত গবেষণা চালাচ্ছে, তাই নয়, জি.এম. খাদ্য সামগ্রী সংক্রান্ত সব সিদ্ধান্তই গ্রহণ করে চলেছে। ইথিওপিয়ার এনভায়রনমেন্ট প্রোটেকশন্ এজেন্সীর জেনারেল ম্যানেজার টিওলডি এগজিয়াভের বলেছেন, জিন প্রযুক্তির গবেষণার উপর সাধারণর মানুষের নিয়ন্ত্রন ক্রমেই সরছে। বিজ্ঞান-প্রযুক্তির এটাই একমাত্র ক্ষেত্র যেখানে সাধারণ মানুষের কোন নিয়ন্ত্রনই নেই। এখানে সবটাই পরিচালিত হয় বেসরকারি ক্ষেত্র'র উদ্যোগে।

অস্বস্তির আরও কিছুকারণ আছে। এই গবেষণা মারফৎ এটাই দেখানো হয়, জিন প্রযুক্তিগত গবেষণাতে যে বিপদের ঝুঁকি যুক্ত থাকে, সেটাকেই খাটো করে দেখানো হয়। গবেষণার অগ্রাধিকারও ঠিক হয় বাণিজ্য নির্ভরতাকে কেন্দ্র করে। বহুজাতিক সংস্থাগুলো গবেষণা কার্যকে এমন একটা স্তরে নিয়েছে যে সবাইকে তাদের উৎপাদিত দ্রব্য সামগ্রীর উপর নির্ভর করতে হচ্ছে। গবেষণা পদ্ধতিকেও তারা প্রায় সম্পূর্ণই নিয়ন্ত্রণ করছে। এই প্রচণ্ড প্রভাবশালী সংস্থাগুলোর স্বরই সংশ্লিষ্ট রাষ্ট্রের প্রকাশক ও উচ্চপদস্থ কর্তারা আর্ন্তজাতিক ফোরামে নিয়ে যাচ্ছেন। মার্কিন গোষ্ঠির অর্ন্তভুক্ত আর্জেন্টিনা, অষ্ট্রেলিয়া, কানাডা, চিলি, উরুগুয়ে জৈব নিরাপত্তা বিষয়ক প্রোটকলকে বে-লাইন করে দিচ্ছে এবং জৈব প্রযুক্তির উপর নিরঙ্কুশ নিয়ন্ত্রন বজায় রাখছে।

এই সব বেসরকারীর সংস্থার নিয়ন্ত্রণ সরকারের উপর যে নিরঙ্কুশ সেটাও না হয় তেমন বড় কথা থাকছে না। কৃষি, শিল্পের থেকে রিপাবলিক্যান ও ডেমোক্রাট উভয় দলের তহবিলেই প্রচুর আর্থিক চাঁদা আসে। আবার এই বহুজাতিক সংস্থাগুলোই সরকারের নিয়ন্ত্রণ সংস্থায় এবং কৃষি ও শিল্পদপ্তরে বিভিন্ন ব্যক্তিদের নিয়োগের জন্য সুপারিশ করে। খুব সহজবোধ্য কারনে উন্নত দুনিয়ার সরকারগুলো সেই সব সুপারিশ মেনে নেয়। ফলে সরকারের সিদ্ধান্ত গ্রহণকারী (Policy making body) সংস্থার সঙ্গে এই সব গবেষণা সংস্থার কর্তাদের গ ভীর সম্পর্ক গড়ে ওঠে। এই প্রোটকল নিগোশিয়েশনের নেতৃত্ব দিয়েছিলেন মার্কিন এনভায়রনমেন্টাল প্রোটেকশন এজেন্সীর প্রশাসক উইলিয়ম রাকসেল। তিনি মনসান্টো বোর্ডের একজন কর্মকর্তা ছিলেন।

ক্যালিফোর্নিয়ার Institute for Development studies 2000 -এ এক প্রতিবেদনে বলেছিল, বৈদেশিক সাহায্য দানের নামে মার্কিন করদাতাদের অর্থ এমন সব সংস্থার হাতে তুলে দেওয়া হচ্ছে যারা জিনগত গবেষণায়

সবটুকুকেই নিয়ন্ত্রণ করে থাকে। পরোক্ষে, জৈব প্রযুক্তি গবেষণার অর্থ সাধারণ মার্কিনি করদাতাদের কাছ থেকেই আসছে।

এই বহুজাতিক সংস্থার উপর মাত্রাতিরিক্ত নির্ভরশীলতা উন্নয়নশীল দেশগুলোতে খাদ্য - নিরাপত্তার প্রশ্নকে যেমন বিপন্ন করবে তেমনি যেসব সংকীর্ণ চুক্তি তারা তৈরি করছে তার মারফৎ এটাই ঘটবে যে জার্মপ্লাজম এর একমাত্র উৎস তারাই। এই চুক্তির মারফৎ এটাই ঘটছে যে কৃষকরা বীজগুলোকে পুনরায় রোপন করতে পারবে না। যেহেতু তারা জার্মপ্লাজম এর একমাত্র সরবরাহকারী দেশ, তাই তাদের আবিষ্কৃত terminator technology দিয়ে তার বীজগুলোকে বন্ধ্যা করে দিচ্ছে। ফলে নতুন বছরের বীজের জন্য তাদের আবার সেই বহুজাতিক সংস্থার দ্বারস্থ হতে হচ্ছে কৃষক সমাজকে। মার্কিন দেশের মিসৌরি কেন্দ্রিক মনসান্টো যারা জি.মে.ফুডের প্রায় সবকিছু নিয়েই গবেষনা করে (রাসায়নিক, ওষুধ, কৃষি এবং ভোগ্যসামগ্রী) তারা জনপ্রতিবাদের সামনে পড়ে স্বীকার করেছে যে terminator সংক্রান্ত সব গবেষনাই বাতিল করেছে। তবে সম্প্রতি মনসান্টো এমন গবেষনার চেষ্টা চালিয়েছে যে সেটা terminator'র অনুরূপ।

Genetically Modified Organism উৎপাদনের সঙ্গে অনেকগুলো ঝুঁকি যুক্ত হয়ে আছে। পরিবেশ দুষণের ঝুঁকি এক্ষেত্রে অনেক বেশী। (যে নতুন চরিত্র উদ্ভাবিত হয়েছে, সেটা যদি বন্য জীবনে প্রবেশ করে) মানুষের শরীরের সমূহ ক্ষতি হবে যদি খাদ্যসামগ্রীতে অ্যালার্জির উপকরণ লুকিয়ে থাকে। সঙ্গত কারণেই উন্নত দেশগুলোতে কৃষি ও পরিবেশের বিপদের সম্ভাবনা বেশী। ট্রান্সজেনিক প্লান্ট নিয়ে যে পরীক্ষা নিরীক্ষা উন্নত দেশগুলো অন্যান্য দেশে চালিয়ে যায়, সেগুলো নিয়ন্ত্রণ করবার মতো ক্ষমতা ভুক্তভোগী দেশগুলোর নেই। কারণ সেই দেশের আইন ও নিয়ন্ত্রক সংস্থাগুলো অত্যন্ত দুর্বল। অথচ উন্নত দেশগুলো সেই ক্ষমতা রাখে। কিন্তু উন্নতশীল দেশের কৃষিক্ষেত্রে ট্রায়াল যখন চলে, তখন সংশ্লিষ্ট দেশের নাগরিক এবং সমাজ এর পার্শ্বপ্রতিক্রিয়া সম্পর্কে অবহিত হতে পারে না। ফলে জিনগত দুষণ বিষয়ে তারা এক প্রকার অজ্ঞই থাকছে। অথচ তার দেশেই তেমন পরীক্ষা নিরীক্ষা চলছে।

জি.এম ও সম্পর্কে যে পূর্বসতর্কতামূলক ব্যবস্থা নেওয়ার কথা ভাবা হয়েছিল, জৈব প্রযুক্তি কর্পোরেশন প্রথম থেকেই তার বিরোধিতা করে এসেছে। আবার এগুলো ব্যবহারের ক্ষেত্রে যে ঝুঁকি থাকে, সেই সম্পর্কেও তারা কোন দায়িত্ব নিতে নারাজ। যে ঝুঁকিগুলো উৎপাদনের সঙ্গে অথবা উৎপাদিত দ্রব্যের সঙ্গে যুক্ত থাকে সেগুলোকে নিয়ন্ত্রণ করবার কথা ১৯৯২- এর কনভেনশন অন বায়োলজিক্যাল ডাইভার্সিটিতে (সিবিডি) উঠেছিল এবং স্বাক্ষরিত হয়েছিল। উন্নয়নশীল দেশগুলো 'সিবিডি'তে আন্তর্জাতিক নিয়ন্ত্রণের প্রস্তাব রেখেছিল। সেটা উত্তরাংশের ধনী দেশগুলোর উপর একটা চাপ রাখবে ধরে নেওয়া হয়েছিল। উন্নয়ণশীল দেশগুলোর তরফে প্রস্তাব ছিল যে তাদের আইনী দুর্বলতা ও ফাঁকফোকরের কারনে উন্নত দেশগুলো যেন ট্রান্সজেনিক প্লান্ট নিয়ে গবেষনা না চালায়।

উন্নয়নশীল দেশের গভীর উদ্বেগের কারণেই সিবিডিতে বায়োসেফটি প্রোটকল সংগঠিত এবং সংযুক্ত হয়েছে। বায়োসেফটি প্রোটকল নিয়ে আট বছরেরও বেশি সময় ধরে আলোচনা চলেছে। দু'টো ইস্যু এক্ষেত্রে গুরুত্বপূর্ণ হিসেবে দেখা দিয়েছে। যে সব দেশ জি এম ও রপ্তানী করছে তারা আমদানীকারী দেশের সঙ্গে Advanced Informed Agreement করবে কিনা এবং জি.এম ও. -র প্রকৃতি ও পরিধি প্রোটকল দ্বারা নিয়ন্ত্রিত হবে কিনা? কিন্তু মার্কিনিরা GMO শব্দতেই আপত্তি জানাচ্ছে। GMO বদলে Living modified organism

শব্দ ব্যবহারে তারা চেষ্টা চালাচ্ছে। এতদিন পর্যন্ত GMOকে সরাসরি উপভোক্তাদের হাতে তুলে দেওয়া হত। মার্কিনি চাপে GMO'র পরিবর্তে থাকবে Living Modified Organism। যেমন কৃষকরা টম্যাটো, আলু এবং বিভিন্ন ধরনের চাল সরাসরি পেত। GMO's for Food Feed or Processing (LMO-FFP)

CBD তে আবার আলোচনা শুরু হয় 1995 তে। যে সময় Bio-Safety working group এ আলোচনা চলতে থাকে। এই ওয়ার্কিং গ্রুপ ১৯৯৬ থেকে ১৯৯৮ এ পাঁচবার বিতর্কিত বিষয়গুলো নিয়ে আলোচনা চলে। দেখা যায় আগের মিটিং এর চেয়েও আরও বড় বিতর্ক দানা বাঁধে পরবর্তী মিটিং এ। বায়োসেফটি প্রোটকল নিয়েই প্রশ্ন ওঠে। মিয়ামি গোষ্ঠির ৩টি রাষ্ট্র যথা মার্কিন, কানাডা ও অষ্ট্রেলিয়া GMO রপ্তানীকারক দেশের উদ্দেশ্যে পূর্বসতকতামূলক ব্যবস্থা গ্রহনের বিরোধিতা করতে থাকে। এরা (মিয়ামি গোষ্ঠীভূক্ত) বলে যে বায়োসেফটি প্রোটকল নির্ধারিত নিয়ন্ত্রণ ও পূর্বসতর্কতামূলক (Precautionary principle) ব্যবস্থাকে অবশ্যই বিজ্ঞানভিত্তিক বা বিজ্ঞানকেন্দ্রিক হতে হবে। ১৯৯৮ এর মিটিং সম্পর্কে ভাবা হয়েছিল যে এটা একটা সমাধান সুত্র দিতে পারবে কিন্তু সেটাও বৃথা হয়ে যায়। প্রশ্ন হল জেনেটিক্যাল মডিফায়েড খাদ্যসামগ্রী কি স্বাস্থ্য এবং পরিবেশের পক্ষে ক্ষতিকারক? হলে সেটার স্বরূপ কি? এই বিষয়ে যাওয়ার আগে উন্নয়ণশীল দেশগুলো কার্টাগেনা প্রোটকলে পূর্বসতর্কতামূলক ব্যবস্থা হিসেবে কি বলেছিল তা বিচার করা যাক। বায়োসেফটি প্রোটকল বুঝতে হলে এই পূর্ব সতর্কতামূলক ব্যবস্থা সম্পর্কে সম্যক অবহিত হওয়ার প্রয়োজন আছে। এই পূর্বসতর্কতামূলক ব্যবস্থার সাহায্যে সংশ্লিষ্ট দেশ (আমদানিকারক দেশ) পর্যাপ্ত বৈজ্ঞানিক তথ্য ছাড়াই জি.এম.ও. দ্রব্যসামগ্রীকে দেশাভ্যন্তরে প্রবেশাধিকারে বাধা দিতে পারবে। বাস্তবিক ইউরোপের বহু দেশ কার্টাগেনা প্রোটকলের পূর্বসকতামূলক ব্যবস্থা দ্বারা WTO চুক্তির প্রাধান্যকে মানতে অস্বীকার করে। কারণ WTO চুক্তিতে বলা ছিল যে, কেবলমাত্র বিজ্ঞান সম্মত তথ্যের ভিত্তিতে খাদ্যদ্রব্যকে বিপজ্জনক বলে মনে হলে, সেই দ্রব্যের আমদানী নিষিদ্ধ করা যেত। ফলে এই পূর্বসতর্কতামূলক ব্যবস্থা উন্নতশীল দেশগুলির হাতে গুরুত্বপূর্ণ ব্যবস্থা হিসেবে গৃহিত হয়েছিল এবং সেটা যাতে ঘটতে না পারে তার জন্য মার্কিনিরা যথেষ্ট বাধার সৃষ্টি করেছিল। মার্কিনিদের বক্তব্য ছিল যে প্রোটেকশনিজম্‌কে আড়াল করতে পূর্বসতর্কতামূলক ব্যবস্থাকে বলবৎ করার জন্য কার্টাগেনা প্রোটকল মারফৎ উন্নতশীল দেশগুলো চেষ্টা চালাচ্ছে।

আরও বিষয় হল কার্টাগেনা প্রোটকলে সেভিংস ক্লজ -এর ব্যবস্থা ছিল যার মারফৎ আগের সব ধরণের বানিজ্যচুক্তি, অধিকার, দায়বদ্ধতা পুরোপুরি বহাল রাখবার ব্যবস্থা আছে। কিন্তু মার্কিনিরা চেয়েছিল যে WTO -র শর্তাদি দ্বারাই দ্রব্যসামগ্রীর (GMO)গুণাগুণ যে বিচার করা হয়। সেভিংস ক্লজ ছাড়াও প্রোটকলে আছে 'বায়োসেফটি ক্লিয়ারিং হাউসে'র ব্যবস্থা। GMO সামগ্রী রপ্তানির অনুমতি দেবার ১৫ দিনের মধ্যে লেবেলিং বা মোড়ক নিয়ে দেশগুলো নিজেদের আলোচনা ও তথ্যাদি আদান-প্রদান করতে পারবে।

কার্টাগেনা প্রোটকলের বিষয়ে পরিবেশবিদ সুমন সহায় -এর বক্তব্য হল GMO সামগ্রীতে উপযুক্ত মোড়ক বা লেবেলিং না থাকলে বা মোড়কের সঙ্গে দ্রব্যসামগ্রীর গরমিল থাকলে উন্নতশীল দেশগুলি বিশেষ করে ভারত GMO সামগ্রীর ডাম্পিং গ্রাউন্ড হিসেবে ব্যবহৃত হবে। কানাডা, অষ্ট্রেলিয়া এবং মার্কিনিরা সেই দেশের GMO সামগ্রীকে ভারতে পাঠানোর জন্য একপায়ে দাঁড়িয়েই আছে।

১৯৯৯ এর শেষদিকে জি.এম.ও দ্রব্যসামগ্রীকে ও তাদের বানিজ্যকে নিয়ন্ত্রণ করতে এক আন্তজার্তিক শাসনতন্ত্র (Frame-work) তৈরি করে। বিশ্বের ১৪০ টি দেশের পরিবেশবিদ ও আলোচকরা এক সপ্তাহ ধরে

সুতীব্র আলোচনার পর আইন তৈরি করতে সমর্থ হয়েছে। এই আইনের সাহায্যে সংশ্লিস্ট দেশ তার পরিবেশ, কৃষিকাজ ও কৃষকের স্বার্থের কথা বিবেচনা করে জি.এম.ও দ্রবসামগ্রীর চলাচল নিয়ন্ত্রণ করতে পারবে। জি.এম.ও খাদ্য সামগ্রীর উপর সুস্পষ্ট ছাপ (Labelling) থাকতে হবে এই মর্মে যে এটা জেনেটিক্যালি মডিফায়েড।

এই আইনি ধারাগুলোই জৈব নিরাপত্তা বিষয়ে কার্টাগেনা প্রোটকলে অর্ন্তভূক্ত হয়েছিল। কিন্তু এই কার্টাগেনা প্রোটকলের বিষয়ে সর্বসম্মতি পাওয়া প্রায় দুষ্কর হয়ে যায় মার্কিনি জেদ এর কারনে। কারন মার্কিনিরা যে কোন আপোষ আলোচনা চালায় তার বানিজ্য স্বার্থ দ্বারা; পরিবেশ সুরক্ষার ব্যাপারটা তাদের ধর্তব্যের মধ্যেই থাকে না। ১৯৯৯ এর ফেব্রুয়ারী থেকেই, জৈব নিরাপত্তার প্রোটকল তৈরির সময় থেকেই, মার্কিনিরা ঐকামত্যে পৌঁছানোর বিষয়টিকে আটকাতে জোর প্রচেষ্টা চালায়। তাদের আশঙ্কা ছিল কার্টাগেনা প্রোটকলের ধারাগুলো এতই বিস্তির্ণ হবে, যে খাদ্যশস্য এবং সয়াবীনের বানিজ্য (যা সর্বতো ভাবেই জি.এম.ফুড) বা রপ্তানীর পুরো ব্যাপারটিই আটকে যাবে। মার্কিনি বহিরবানিজ্য ও অর্থনীতির এটা গুরুত্বপূর্ণ অংশ। ১৯৯২ এর রিও-ডি জেনারোতে সংগঠিত কনভেনশন অব বায়োলজিক্যাল ডাইভার্সিটিতে মার্কিন কংগ্রেস যেমন স্বাক্ষর করেনি, কার্টাগেনা প্রোটকল সম্পর্কেও সেই একই মনোভাবের প্রতিফলন ঘটে। কার্টাগেনা প্রোটকলে মার্কিনিদের অবস্থান ছিল নিছক অবজানভার ' এর। তথাপি তার গোষ্ঠীভূক্ত অষ্ট্রেলিয়া এবং কানাডার সাহায্যে প্রোটকলকে সে প্রভাবিত করতে সক্ষম হয়। তবে ইতিবাচক দিক হল, প্রোটকলে স্বাক্ষরিত দেশগুলোতে মার্কিনি জি.মে.সামগ্রী ঢুকবে কিনা, সেটা ঠিক করবে সংশ্লিষ্ট দেশই।

সমালোচকরা প্রশ্ন তুলেছেন বায়োসেফটি প্রোটকলের রক্ষাকবচ নিয়েই। উন্নত দেশের রপ্তানীযোগ্য পন্যে 'জি.এম. সামগ্রীর থাকতে পারে' (GM may contain) এই ছাপাটিই যথেষ্ট নয়। কারণ খাদ্যশস্য বা প্রাণীর দেহাংশ থেকে প্রক্রিয়াকরণ মারফৎ যা উৎপাদিত হবে সেটাকে জি.এম. খাদ্যসামগ্রী হিসেবে বিবেচিত করা চলবে না। যেমন কর্নফ্লেকস্ GM ভুট্টা থেকে তৈরি হলেও কর্নফ্লেকস্‌কে GM বলা যাবে না। নিঃসন্দেহে এটা বায়োসেফটি প্রোটকলের একটা ফাঁক। আগের প্রশ্নে ফিরে যাওয়া যেতে পারে। GM খাদ্যসামগ্রী কতটা ক্ষতিকারক?

এ প্রশ্নে যত গবেষনা হয়েছে, সবগুলিই বাধা প্রাপ্ত হয়েছে উন্নত দেশ দ্বারা। ফলে জি.এম. খাদ্যসামগ্রী ব্যবহারের ক্ষেত্রে পূর্বসতর্কমূলক ব্যবস্থ' গ্রহনের প্রয়োজন এক্ষেত্রে আছে, যা দিয়ে বোঝানো যাবে যে এখানেও এক Nasty Surprise অপেক্ষা করে আছে। ২০০০ এর জানুয়ারীতে ইলিনয়েস ইউনিভার্সিটি ইভেন্ট ১৭৬ বীজ তৈরী করে। নোভারটি সীডস্ নামে এর পরিচিত। ব্যাসিলাস্ থুরিনজেনেসিস্ এর জীন এর মধ্যে বসানো হয়। বলওয়ার্ম এবং কর্ণবোরারকে মারবার জন্য এটাকে কাজে লাগানো হয়। এর পূর্বে অর্থাৎ ১৯৯৯ এর মে মাসে Cornell University র প্রকাশিত প্রতিবেদনে দেখা যাচ্ছে, নোভার্টিস Yield guard Bt. Cotton (Bt 11) মনার্ক বাটারফ্লাই এর ক্ষেত্রে প্রভূত ক্ষতিকারক। এই বিষয়ে Iowa University 'র গবেষণা আগের সব সিদ্ধান্তকেই সুদৃঢ় করেছে। খুব স্বাভাবিক কারনেই GMO খাদ্যসামগ্রী প্রাণীর দেহকেও ক্ষতিগ্রস্ত করছে। Corn Borrer এর বদলে অনান্য orgainsm ও ক্ষতিগ্রস্ত হচ্ছে।

ক্যাটারপিলার এবং বাটার ফ্লাই অর্থাৎ প্রজাপতি হচ্ছে বায়োলজিক্যাল ইন্ডিকেটর। ব্রাজিলের বাদামে অপ্রত্যাশিত ভাবে অ্যালার্জিন মিলেছে। ১৯৯৬ এ New England Jounal of Medicine এ দেখানো হয়েছে যে ব্রাজিলের বাদামের মিশ্রণে সয়াবিন ও অ্যালার্জিনের বদল ঘটেছে।

আধুনিক বিশ্বের প্রায় গোটা জি.এম. বীজের বাজার অধিকাংশই দখল করে আছে মনসান্টো সংস্থা। Frontline -এর ১১ই মার্চ সংখ্যায় এই মনসান্টোর বিরুদ্ধে বিস্ফোরক তথ্যাদি প্রকাশিত হয়েছে।

ইন্দোনেশিয়াতে সরকার কর্তাদের Environmental Impact Assessment (EIA) তুলে দেবার জন্য ঘুষ দিতে গিয়ে মনসান্টোর কর্তারা ধরা পড়ে যায়। EIA তুলে দিলে অথবা শর্তাদি শিথিল করলে ইন্দোনেশিয়াতে যেমন খুশী GM বীজ উৎপাদন করা যাবে।

২০০২ -এর মার্চ এ মনসান্টো তার এক পদস্থ ম্যানেজারকে ইন্দোনেশিয়ার পরিবেশ বিষয়ক মন্ত্রক -এর অপর কর্তাকে ৫০,০০০ ডলার উৎকোচ প্রদানের নির্দেশ দেয়। কনসাল্টিং ফি -এর নামে এই বিপুল টাকা দেবার জন্য বলা হয়েছিল। ১৯৯৭-২০০২ সালের মধ্যে এই অবৈধ টাকা লেনদেনের কথা মনসান্টো স্বীকার করেও নিয়েছে। জি.এম. বীজের ব্যবহারের ছাড়পত্র পেতেই এই অবৈধ অর্থের হস্তান্তর।

এই অবৈধ লেনদেনের বিষয়কে লঘু করে দেখাতে গিয়ে মনসান্টোর এক মুখপাত্র লোরি ফিসার সান্ডে হেরাল্ডের সম্পাদক রব ইউয়ার্ডকে জানান যে আভ্যন্তরীণ অডিট্ চলাকালীন এই অবৈধ লেনদেনের বিষয়টি ধরা পড়ে। তার মতে এটাকে ঠিক ঘুষ বলা চলে না।

কিন্তু অসরকারি সংস্থা জি.এম. ওয়াচের ডিরেকট্র জনাথন ম্যাধুস্ বলেন মনসান্টোর এই অবৈধ লেনদেন বরফের শীর্ষভাগ মাত্র। মনসান্টো সংস্থার প্রতিষ্ঠার পর থেকে তাঁর উৎপাদিত পন্যের স্বরূপ নিয়ে ডঃ ক্লটার যে গবেষনা করেছেন, যেখানে তিনি দেখিয়েছেন, 'Monsanto has a long history of bringing out products that have proved harmful to people and the environment.'

মনসান্টোর উৎপাদিত হার্বিসাইড ২, ৪, ৫ - T অত্যন্ত বিষাক্ত রাসায়নিক পদার্থ দিয়ে তৈরি। এই বিষাক্ত পদার্থ দিয়েই তৈরি হয়েছিল এজেন্ট অরেঞ্জ।

ভিয়েৎনামে সামরিক অভিয়ানে এই এজেন্ট অরেঞ্জ ব্যবহৃত হয়েছিল।

Dr. Klotter, কার্টে জেনকিন্স এর ১৯৯০ এর রির্পোট উদ্ধৃত করে মনসান্টোর বিরূদ্ধে গুরুতর অভিযোগ আনেন। মার্কিন এনভায়রনমেন্ট প্রোটেকশন এজেন্সীর রসায়নবিদ ডঃ কার্টে জেনকিন্স তার রির্পোট Criminal Investigation of Products - Falsification of Dioxin Health studies' এ জনস্বাস্থ্য বিপর্যয়ের উল্লেখ করলেও, মনসান্টোর চাপে সেই রির্পোট ধামাচাপা পড়ে যায়।

মনসান্টোর অন্য উৎপাদিত দ্রব্য অ্যাসপারটেম যা চিনির চেয়ে বেশি মিষ্টি বলে মনসান্টো দাবি করেছে, সেটাতেও আম্লিকতা (Toxicity) আছে বলে Dr. Klotter জানিয়েছেন। মনসান্টো আম্লিকতার বিরুদ্ধে যাই বলুক ১৯৯৬ এ প্রকাশিত Journal of Neuropathology and Experimental Neurology রিপোর্টে অ্যাসপারটেম ও ব্রেন্ ক্যান্সারের মধ্যে সরাসরি যোগাযোগ আছে বলে জানিয়েছে।

মনসান্টোর Recmbinant Bovine Growth Hormone (RBGH) যা বাজারে Posilac নামে পরিচিত এবং গোরুর দুধ বৃদ্ধি করবার জন্য ব্যবহৃত হয় তার বিরুদ্ধে Wisconsen's Farmer's Association জানিয়েছে যে Posilac প্রয়োগে গরুর শরীরে ভয়াবহ রোগ দেখা দিচ্ছে এবং বিশ্বের দেশে এটাকে নিষিদ্ধ করা হয়েছে। সুইডেনের দুই বিখ্যাত অঙ্কলজিষ্ট ডঃ লেনটি হার্ডেল এবং ডঃ মাইকেল এরিকসন মনসান্টোর সর্বাধিক বিক্রিত আগাছানাশক গ্লাইফোসেটের সঙ্গে 'নন-হজকিন্স লিম্ফোমা'র প্রায় সরাসরি সংযোগের কথা বলেছেন।

১৯৯৯ এর ১৫ মার্চ এর Journal of Americal Cancer Society তে গবেষকরা দেখিয়েছেন,

গ্লাইফোসেটের প্রত্যক্ষ অথবা পরোক্ষ সংযোগে 'নন হজকিন্স লিম্ফোমা'র ঝুঁকি বহুগুন বেড়ে যায়। আন্তর্জাতিকস্তরের অসরকারি সংগঠন Organize Consumers Association যারা খাদ্যের গুণাগুণ ও নিরাপত্তার বিষয়ে বহুলভাবে সাধারণ মানুষকে সজাগ করতে সচেষ্ট তারা বলেন যে মনসান্টো বীজ উৎপাদনের পরেই, মনসান্টোর উৎপাদিত হার্বিসাইড এর চাহিদা বহুগুন বৃদ্ধি পেয়েছে। অবস্থাটা এমন যে, যারাই মনসান্টো বীজ ব্যবহার করবে তারাই মনসান্টো হার্বিসাইড ব্যবহার করতে বাধ্য হবে।

কানাডার বিভিন্ন প্রান্তের কৃষকদের খেতের দেশীয় বীজের চাষাবাদ পার্শ্ববর্তী মনসান্টো বীজের উদ্ভিদ দ্বারা বিষাক্ত হবার ঘটনাও আকছার ঘটেছে বলে বিভিন্ন অসরকারি সংগঠনকে জানিয়েছে।

চলতি বছরে অন্ধ্র প্রদেশের মনসান্টোর বীজ-বিটি তুলো উৎপাদক দারুনভাবে মার খায়। ওয়ারাঙ্গালে অত্যন্ত কম তুলোর উৎপাদন হওয়ায় জেলা প্রশাসন মনসান্টো মাইহককে উপযুক্ত ক্ষতিপূরন দেবার নির্দেশ দিয়েছে।

শতকরা ৩০ থেকে ৬০ ভাগ ফসলের ক্ষতি হয়েছে সরকারি হিসেব। রাজ্য সরকারের গঠিত কমিটির মতে ত্রুটিপূর্ণ বীজের কারনে ফসল ক্ষতিগ্রস্ত হয়েছে প্রায় ৫০ ভাগ। প্রতি একরে ১.৫৭ কুইঃ ফসল নষ্ট হয়ে গিয়েছে। টাকার অঙ্কে যার পরিমান ৩.৩ কোটি টাকা। নবসেমপেটের অধিবাসীরা অভিযোগ করে বলেছেন যে ক্ষতিপূরন কমিয়ে দিয়ে মন্সান্টোর সঙ্গে সম্পর্ক গড়ে তোলা হচ্ছে।

পরিবেশবিদ সুমন সহায় পরিচালিত অসরকারি সংগঠন, জিন্ ক্যাম্পেইন্ দাবি করেছে সব ধরনের বিটি কটন ভারতীয় জল হাওয়ার পক্ষে উপযোগ কিনা, সেটা যেন যাচাই করে দেখে তবেই চাষাবাদের কাজে ছাড়পত্র দেওয়া হয়। বিশ্বের বিভিন্ন স্থানে বিশেষ করে দক্ষিন আফ্রিকা ও ল্যাটিন আমেরিকার দেশগুলোতে মনসান্টো বীজগুলোকে নিষিদ্ধ করা হলেও ভারতে সেটাকে ছাড়পত্র দেওয়া হচ্ছে। জিনক্যাম্পেইন, জার্মান চার্চ ডেভেলপমেন্ট সার্ভিস, দ্য ইন্সটিট্যুট ফর এগ্রিকালচার এ্যণ্ড ট্রেড পলিসি প্রভৃতি অসরকারি সংস্থাগুলো মার্কিন খাদ্য ও প্রশাসন GM খাদ্যদ্রব্যের নিরাপত্তার বিষয়ে যে নিয়মাবলী (Guideline) প্রস্তুত করেছে তাতে আপত্তি জানিয়েছে।

জিন্ ক্যাম্পেইনের সুমন সহায়, জার্মান চার্চ ডেভেলপমেন্টের রুডল্ফ বাল্টজেল্ প্রস্তাবিত নিয়মাবলীকে দায়িত্বজ্ঞানহীন ও সারা বিশ্বের জনস্বাস্থ্যের পক্ষে ক্ষতিকারক বলে বর্ণনা করেছেন।

কার্যক্রমটি মার্কিন দুনিয়াতে থাকবে স্বেচ্ছামূলক কিন্তু বাইরের জগতে এটাকে মডেল হিসেবে ধরতে বলা হচ্ছে।

উন্নয়ণশীল দেশের নিয়ন্ত্রণমূলক ব্যবস্থাকে প্রভাবিত করবার যে আক্রমণাত্মক নীতি মার্কিনি দুনিয়ার আছে এটা তারই প্রতিফলন। আগেই বলা হয়েছে উন্নতশীল দেশগুলোতে নিয়ন্ত্রণমূলক ব্যবস্থা অত্যন্ত দুর্বল। মার্কিনিদের সিদ্ধান্ত মতো এটাকে আরও শিথিল করে দিলে কিংবা খাদ্য কোম্পানিগুলোকে দায়বদ্ধতা থেকে অব্যাহিত দিলে সেটা হবে দুঃস্বপ্নের নামান্তর।

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Land Capacity and Water Availability- A Case Study of Darjeeling Area, Dist. Darjeeling (W.B.) India

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Of the three main components of earth's system- atmosphere, water and land, the land is most heterogeneous. The earth's surface is a mosaic of different types of ecosystems ranging from arid desert to tropical forests to temperate forests from mountains to plains. Man along with other elements of the earth's surface like plants and animal communities uniquely contribute to the functioning of earth system with their capacity to control the nature or the environment. With the growing population and over utilization of natural resources mainly of the land and the accessible water bodies a dilemma between the population increase and utilization of resources has arisen. As land and its capacity of holding the water needed for survival is also at stake in keeping pace with the progress in civilization- the population concentration throughout the world mainly in the urban sectors increasingly involve the depletion of both renewable and nonrenewable resources, which is marked by the non-availability of water, due to the shortage of water in the ground water table. It is mainly due to the lacking of pore surface in the concrete urban sectors.

Here to analyze these problems regarding the carrying capacity of land and water availability and the crisis, the author has taken the Darjeeling urban areas in the district of Darjeeling, West Bengal, a mountainous town as case study where the population growth has doubled in the last 10 years. The urban population is facing a severe water crisis now not only in summer but also in the rainy season.

Thus here the author has tried to make annotation about the land capacity and water availability utilization, the scarcity problem and to make some remedial measures for protecting the environment and safeguard against pollution.

FORESTS OF DARJEELING HILLS

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The continuous and unabated biotic interference upon nature in the present day world has led to widespread destruction of our natural surroundings of which forests form one of the vital components. The situation has led to the deterioration of environment. In India, as well as in many countries of the world, the natural forests are declining at a fast rate. All efforts to replenish it have not been encouraging at all. The density of forest cover is also diminishing. As far as Darjeeling hills is concerned the total area under forest is 1,186 sq. km., *i.e.*, about forty nine per cent of the total geographical area of the hills. However, due to heavy encroachment of forest land for various non-forestry activities in the hills, the forests area is continuously shrinking. As against sixty six per cent of forest cover prescribed for hill region according to National Forest Policy of India, the present forest cover is around thirty five per cent only. Under these situations, this paper seeks to highlight the causes of deforestation and few suggestions are also given for rejuvenation and development of forest resources in the hills.

THE CASE OF DEFORESTATION IN CHERRAPUNJI
Clafification of Certain Myths

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Cherrapunji, the wettest place on the earth, has become dry. It does not receive the maximum amount of rainfall as it was wont to. There is a scarcity of water. There are no trees around. All this has been attributed to large scale deforestation. People in the past have cut down trees mercilessly. This example is cited all over to warn people of the ill effects of deforestation. Media have gone on record saying that Cherrapunji is receiving drought and flood.

But is this the real cause? We have the habit of generalizing things without proper research. People accept easy solutions, thereby misleading the future generations and themselves. At times there are also other causes of lack of rainfall.

During my association with Cherrapunji for almost fifty years now. I have always seen scarcity of water. I have never seen trees. Hills were always barren. Rainfall did lessen. On the other hand there are sacred forests in Cherrapunji. People are not normally allowed to cut trees. This is observed religiously. The society has a system of monitoring this. There are occasions when people go to cut trees. Yes, they do of course cut down trees in large numbers in order to make charcoal which is consumed in huge quantities. But it seems strange that even if trees were cut down earlier on, there should have been traces of the roots. Unless, of course, the trees were uprooted and the holes filled up neatly, that too in the whole area this cannot happen.

As one travels towards Cherrapunji from Shillong there is a place called Umtyngar which is halfway between Shillong and Cherrapunji. One observes that abruptly trees have vanished from the hills.

All this led me think that there must be some other reasons for lack of rainfall in Cherrapunji. It was found out that a place which receives such huge amount of rainfall as Cherrapunji, seeds cannot germinate due to a flooding situation in the soil. Hence, trees cannot grow. As tree cannot grow top soil is washed away and again as top soil is washed away trees cannot grow. As trees cannot grow rain decreases.

In addition to this large deposits of limestone and possibly a large presence of iron may have its effects on the growth of trees.

As effects of degradation on environment may not be felt locally always, it is possible that extraneous reasons have their impacts on rainfall in Cherrapunji. For whatever reasons we find that this region does not receive the highest amount of rainfall in the world an more. The credit is now received by the Fiji islands.

Hence, we find that it may not be always proper to generalize things. It may not also be proper to apply a theory to a place which has been tested elsewhere and not the place under discussion.

Industrialization and Land Utilization A Changing Scenario : A Case Study of Malda District

Prof. Ruma Sengupta and Dr. Anuradha Sengupta

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The district of Malda is purely based on an agrarian economy. From the point of view of economic growth, Malda still lags behind and is largely considered as backward district of West Bengal. This region has witnessed massive population explosion after the completion of the Farakka Barrage. It has also experienced heavy urbanization. Along with these developments large, medium and small-scale industries have also mushroomed. Within the industrial sector, quite a large chunk is already well-established. Some of the small-scale industries are flourishing without any steady mineral resource base. They are progressing only with local ingredients. As any industrial boom requires healthy capital investment, the progress of industrialization in Malda indicates the flow and availability of the capital. Already seventy two industries are well-set in Malda. This rapid industrialization has changed the landscape scenario of Malda drastically. Previously, the land which were used for agriculture, settlement and road construction or earmarked as pasture land, barren land or forestry areas – are currently facing a metamorphosis.

So the paper seeks to analyze this changing scenario of landscape pattern. It attempts the problems and prospects that may emerge from this existing situation of landscape change.

Global Warming : The Effects and Politics

Prof. Md. Golam Sabbir

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Global warming is not a distant theory but a fact in our lives. Since the dawn of the civilization, human activities have consistently influenced the earth's environment. Earth in response tried to regenerate from all torturous activities of human beings but now it has reached the limit. Due to increasing concentration of "greenhouse gases" in the atmosphere the global temperature is rising and as a consequence of global environmental change, a series of catastrophes may come for which large parts of the civilized world may not survive. The science behind the global warming is already well established and the scientists having done their jobs send their reports to governments. Minister sometimes receive these predictions with genuine shock, promise to do something and the let the world go on the same way as before. There are serious political rumbling over the issues of climate change. There are still those who argue against action and those who think that action is urgent now; in particular the small coastal and island nations that are likely to disappear below the rising sea and the environment groups whose interest is in keeping these issues in public eye. In this review, the "greenhouse effect" and its current and future effects have been explained with an update of latest of science; besides an overview on global politics on the emerging issues in global climate change has been discussed.

Presented Papers :
On
Creative Education

Creative Minds For Sustainable Development

(Abridged version of the lecture)

Dr. Rita Sinha

Professor of Education, University of Calcutta

The 21st century is probably qualified with three 3 'p'-s : population, pollution and poverty. These three are the basic national problems at least in the context of India. Only a creative mind can combat with these problems. On the other hand, a creative mind can develop effectively only when creativity is nurtured through proper education.

It should be noted that all the problems in relation to population, pollution and poverty as stated above is related in some way or other to environmental issues. Development cannot be separated from life. However the development has to be a sustainable one. It is not easy to ensure sustainable one. Again, only a creative mind can imagine a practical implementation of sustainable development. In ancient India people could arrange that kind of education which nourished a creative mind. Great creative minds of that time could design life style which ensured sustainable development.

Now technology has developed enormously. Accordingly lifestyle has became faster. The old wisdom of sustainable development is no more working. One has to provide answer for balancing the existing state of imbalance! And again, there is a need for creative minds.

Pupils Are Not Pigeons

Prof. Saktipada Patra

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In 2000 Malaysia's ministry of education decided to embark on realizing a vision of turning Malaysia into a thinking society. A thinking society requires thinking citizens who as individual human beings make a distinct contribution to the society in which they live. Thinking citizens require thinking skills. Education should cater to the development of such skills. Such skills can be developed through creative activity, especially in childhood. When we encourage a child to express himself creatively, we help him develop his personality.

Creativity is the highest form of human self-expression. When one is creative, one expresses not what other people think or expect of one but what one thinks or feels, one's own particular point of view. In a creative activity a person puts his own individual personality into what one does. It is done in a way that no other human being would do it. Creative activity brings out the innate qualities with which each human being is born. A teacher who deliberately represses the creative urge in children is failing in his duty to the child. Besides he commits a crime against society by depriving it of that individual contribution which the child may make to the life of his community.

Unfortunately in most of the classrooms the teachers act as expert imparters of information and the students are not given a chance to do the learning themselves. The identity of the learner is seldom involved; his intelligence is seldom engaged. The learning process is one of pure transfer of knowledge from one receptacle to another. The interaction is tightly controlled. Only the teacher has the right to initiate exchanges. The learners are passive recipients. They just wait there to be filled with knowledge. It does not mean that the teachers are not aware of their responsibility. One survey showed that a large majority of teachers had a desire to help young people become independent, autonomous learners but they admitted that they did not practise this.

We should remember that no two human beings ever think, feel or understand in exactly the same way. A number of people may look at the same object at the some time, but each one thinks about it in a different way, in a way that is personal to him .It suggests that creativity is a part of human psyche. All children have the potentials for creativity, though they differ in the degree of creativity they possess. It is now an accepted fact that, like any potential, the environment must provide opportunities for creativity to develop and the stimulation to do so.

Creativity suggests a unique mental process – a process needed to produce something new, different and original. It involves a specific kind of thinking. It is divergent thinking which deviates from the beaten track and seeks variety. It permits rich flow of ideas and opens up a way towards solution that are novel and, hence, creative. It is opposed to convergent thinking which is more typical or traditional in nature and which leads to one right answer. Really creativity indicates a high level of mental activity. A teacher who praises the student for coming up with good answers arrived at by his own methods encourages high level mental activity. Such a teacher discourages rote memorizing and recitation and encourages productive thinking.

It should be remembered that creativity appears early in life. At this time any condition that obstructs its development may stifle it. Unfavourable social attitudes, dampen young children's attempts to be creative. Children should be encouraged to be creative. They should have free time to toy with ideas and try them out in new and original forms. Independence and self-reliance contribute heavily to creativity. Teachers in schools are helpless when the influence of the home is on the wrong side. In schools teachers may try to stimulate creativity but by then, it may be too late. By that time they may have become so accustomed to following a pattern set by others or to thinking in a way others think that acting or thinking in a creative way will be difficult or impossible. The attitude of the parents and that of teachers in schools sometimes hinder the expression of creativity. Because of such attitude the students do not find themselves in conditions favourable to the development of creativity. They discover that creativity is less of an asset than a high IQ in meeting the demands of the home and the school. They also discover that the school encourages and rewards convergent thinking more than potentially creative divergent thanking.

To day teachers very often play the role of the Handicapper General in Kurt Vonnegut's story "Harrison Bergeron' – handicapping the students rather than enabling them, impeding the process of discovery by imposing a process of learning as the teacher finds suitable for them. On the contrary they should value pupil autonomy as an explicit aim of their teaching. Learning how to learn should be looked upon as a key skill. If in the course of their work, children discover a rule for themselves and test it in further examples the rule becomes a part of their own logical thinking rather than a trick to be remembered. Each time a teacher tells children something that they could have discovered for themselves, he prevents them inventing it. Education is not intrusion. Learners have to be weaned away from being breast fed or spoon – fed. The teacher's concern should be the learning achieved, not the teaching thought. It does not mean that the teacher should abdicate his authority to monitor and guide the progress of the students. The issue is, as H.G. Widdowson says,- what kind of authority is most ideologically desirable and most pedagogically effective.

Creative Thinking and Environmental Education

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Environmental education is certainly essential for our common future and sustainable development of the World. But nevertheless we have some questions regarding environmental education: What is "environmental education"? What is the purpose & goal of environmental education? What is the scope of environmental education? What are the conditions for good environmental education? What is the psychological basis of environmental education? What are the most important psychological processes and regularities of forming ecological responsibility?

There is perhaps no simple answer to these questions. There are as many answers to these questions as there are people who deal with environmental education. But there is a real social need for good environmental education. In the sphere of modern environmental education we have a critical contradiction between science and social practice (and society as a whole). But it is not so bad because where there is a contradiction there is an opportunity for good development.

There seems to be no consensus as to the nature of environmental education, and no agreement about its methodology. Sciences like Biology, Chemistry or Geography have their own clearly defined methodologies. But environmental education has not. If we want to search for a methodological basis for environmental education we cannot ignore many psychological factors, regularities and aspects. The most important among them is the question about the origin of person's attitude towards nature and development of environment protection culture.

The responsible attitude of a person towards the environment is the goal and essence of environmental education. Only the acquisition of knowledge and understanding of environmental issues does not necessarily lead to more positive attitudes towards the natural environment. Cognitive understanding does not automatically lead to strong attitudes about an

issue (Moyer, 1975; *An investigation of factors influencing environmental attitudes*.p.266-269). Environmental behaviour can only be influenced via environmental knowledge through practical experiences.

From psychological point of view, a responsible attitude towards nature is a higher psychological function like thinking by concepts, creative imagination, critical thinking etc. Every psychological function has its own organic foundation, special nervous organization in the brain. Organic foundation of responsible attitude towards nature is an inborn capacity to sympathize with the nearest people and subsequently all living beings. From a very early age children start making contact with nature. Attitudes towards the environment are generally acquired very early in life (UNESCO-1977, *Trends in environmental education*, UNESCO, Paris, France). According to Torney (1972), the period from 7 – 12 is optimal both for education directed towards attitudinal objectives and for open-ness about the world.

Development of environment protection culture and responsible attitude towards nature is a conscious process. And as with every conscious process it is quite impossible without thinking skills and abilities. The ability to think creatively is essential if individuals are to live, work, and function effectively in our current and changing society. Children must make choices, evaluations, and judgments every day regarding (1) information to obtain, use and believe, (2) plans to make, and (3) actions to take and I just want to say that definitely they need to develop higher order thinking skills like creative thinking abilities to perform all these three.

What is Creative Thinking?

It has been found from various research findings that there are so many psychological factors like higher order thinking and problem solving skills involved in environmental education as well as in all subject areas. To be a successful problem solver, a learner must possess a balance of creative and critical thinking skills. Creative or divergent thinking focuses on **(1)** exploring unique ideas, **(2)** generating possibilities & **(3)** looking for

many right answers whereas critical thinking involves skills that enable the student to sort, analyze and refine creative ideas.

These two kinds of thinking can be differentiated like this:

Critical Thinking	Creative Thinking
analytic	generative
convergent	divergent
probability	possibility
judgment	suspended judgment
focused	diffuse
objective	subjective
verbal	visual
linear	associative
reasoning	richness, novelty
yes but	yes and

In an activity like problem solving or teaching-learning, both kinds of thinking are important to us. In practice, both kinds of thinking operate together much of the time and are not really independent of each other.

Only the creative thinking abilities and its relation with environmental education will be highlighted and discussed in this paper.

Positive Approaches of Creative Thinking

- Curiosity
- Challenge
- Constructive Discontent
- A Belief that Most Problems can be Solved
- Ability to Suspend Judgment & Criticism
- Seeing the Good in the Bad
- Problems lead to Improvements
- A Problem can also be a Solution
- Problems are Interesting & Emotionally Acceptable
- Perseverance

- Flexible Imagination
- A Belief that Mistakes are Welcome

Teacher will have to utilise all the positive aspects and approaches of creative thinking ability either in classroom or outside while imparting environmental education so as to help a learner to think creatively for a better interaction with the environment. Different creative methods like Evolution, Synthesis, Revolution, Reapplication; Changing Direction etc. will also be applied by the teacher. Further the classroom situation should be modified in such a manner as to support students' emerging creativity. The teacher should be alert about the Time, Space, Materials, Climate and Occasions during teaching-learning process.

Now another question arises :

Why is Environmental Education an Important Focus For CreativeThinking & An Effective Mechanism to Enhance Creative Thinking?

Current and anticipated environmental problems are receiving increased attention in the media, by all levels of government, by citizen groups, and by individuals concerned with the potential implications for human beings and other life forms on Earth. These problems are local, regional, national, and international in scope. Developing workable solutions to environmental problems will require choices and decisions based on a critical examination of information and opinions.

Environmental education provides a good mechanism for developing creative thinking skills by: **(1)** providing topics and problems that cut across the school curriculum which can enhance the divergent thinking ability, **(2)** providing real problems that can be studied and solved, and **(3)** by providing topics and problems that can be adjusted to the developmental levels of students.

Students can exercise their creative thinking when discussing environmental issues; they can more effectively understand environmental concepts by going on field trips and/or doing hands-on activities, and finally, children can participate together with the community in the development of various environmental projects.

What Schools Can Do?

There is a profound difference between goals, objectives, and expectations and demonstrated achievement. Schools need to review what they are doing, what they are achieving, and ways to improve students' thinking abilities.

Many research findings indicate that creative thinking skill has not occurred on any regular basis in most middle, junior high, and senior high schools due to lack of teacher's knowledge, lack of materials, class size and competing demands such as emphasis of tests, coverage of textbook content, and required academic content (Bennett-1987).

In spite of this, the role of schools in developing creative thinking skills is vital in these days of rapid change and is an essential pre-requisite for responsible citizenship (Symons-1994, *Mapping the future*, WWF. Survey, U.K.).

- Schools should concentrate on the development of four major areas: curriculum, issue-based approaches, action-orientated dimension, and value education (Symons 1994).
- Considering these areas of development, schools should help children exercise their critical thinking skills and creative imagination;
- Schools should help children participate in a more thoughtful and active way;
- Schools should help children engage in an active and responsible citizenship in the local and global community.
- Schools should arrange periodical excursion and design environmental projects.

Education in twenty first century should be concentrated upon guidelines and techniques for achieving a new approach. Apparently, schools with an environmental policy are already working towards a holistic approach in education.

What Teachers can Do?

Children's effective learning of environmental issues is strongly associated with the pedagogical and creative approach used by teachers (Barraza, 1996). Only creative and

interested teaching will help learners to develop the knowledge, skills, values and attitudes for a better understanding, appreciation and a sense of caring for the environment.

1. Teacher should transfer his/her own interest, concept and creative ideas, imagination or outlook towards environment among students because appreciation of nature is an impetus for many forms of creative expression.
2. Teacher should provide students chances to explore their activities in regard to environment through plantation, through forest conservation, periodical field trips etc.
3. During teaching, teacher should ask open-ended questions that do not assume the one right answer.
4. Teacher can facilitate creative thinking in classroom and present environmental education as an interdisciplinary approach to helping students develop creative thinking and problem solving skills.
5. Brain storming should be done by teacher.
6. Teacher should design different environmental projects for students in order to increase students' understanding of our complex environment; to stimulate critical and creative thinking; to develop the ability to make informed decisions on environmental issues; and to instill the confidence and commitment to take responsible action on behalf of the environment.
7. Teacher should develop Environment Protection Culture.

Suggestions & Conclusion

1. In order to promote an active global citizenship and an environmental responsibility for children, schools need to change their policies, their organization and structure too.
2. In order to make an effective impact on the child's education, teachers need to be provided with an opportunity to develop the necessary thinking skills, along with encouragement and support because a teacher is not only a communicator but a model (Bruner 1969).
3. It is important to do more research on the pedagogical approaches that teachers are using in the transmission of environmental issues, as well as to find out whether or not teachers are using the official guidelines for environmental education in their practice.
4. To find ways in which learners and teachers are responding to the environment i.e. attitudes and values.
5. The emphasis of environmental education in schools should be on inquiry and investigation by the learners themselves, including their direct experience.

"In the end we will conserve only what we love, we will love only what we understand, we will understand only what we are taught"

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Natural Phenomena is the Real Educators and the Role of the Great Educators for Environmental Studies

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"One of the unique endowments of human-being is the internal urge for the better. It is this creative urge, which has impelled him to alter given conditions of life to create a civilized order of existence". (1)

If we study the lives of the great educators then we will realize that all of them had a creative urge. They are still remembered till to-day because of their creation. I would like to mention few of our great educators contribution to education and environment. Before that the term ecology should be clarified. "The term ecology and the similar word 'Economy' are derived from the Greek 'Oikos' meaning 'home' or household'. Whereas Economy is concerned mainly with industry, commerce, taxation and so on, 'Ecology' embraces the entire household of nature the plants and animals and their relationship with each other and with their environment.(2)

The problem of environment is observed everywhere. The cosmic calendar shows that 15 Billion years ago the universe originated. Earth originated 4.6 Billion years ago. Life originated 3.6Billion years ago. Environment was there with life but without man. Man originated approximately 250,000 years ago when the onset of pollution occurred. (3) Problem arises when man tried to transform nature for their own satisfaction. The ruthless exploitation of nature brought ecological crisis. Now the ecological crisis is threatening the survival of human and animal species and the green mantle of the world. The world is engulfed with air, noise, river pollution, deforestation and in this way ecological balance is decreased.

If we go back to our ancient educational system then we see that our ancient teachers wanted to synthesise our phenomenal nature with human nature.

"Nature worship was a part and parcel of the religious life of the Vedic Aryans"... "the sky the atmosphere and the earth exhibited such attractive and wonderful phenomena that they sang praises to them in the form of hymns".(4) Our ancient educational institutions like Tapavana, Gurukula and Ashramic Vidyalaya gave importance on beautiful phenomenal nature which really influenced the students' young minds and they developed a love and yearning for the plants, animals, the blue sky and starry sky at night.(5)

In this matter our modern educators names also could be mentioned such as Roussearu, Froebel, Montessori, Ravindranath, Aurobindo. Another name also could be mentioned-Jhon Aamos Commenius. They were quick to spot ecological problems. They realized the beautiful nature could be destroyed anytime by an earthquake, flood or storm. These were again natural phenomena but serious problem could arise by man's ruhless exploitation of nature. Comenius in 1657 through his educational classic Didactic a Magna or Great Diotaclic said, "nature was a great laboratory where truth should be discovered and tested ..... Learn as much as possible, from the great book of nature"(6). In his educational treatise Emil written in 1762. Rousseau propagated going back to nature and introduced his favourite doctrine of naturalism in education. He introduced child centric education because to him the child is "innocence incarnate" (7). In the opening lines of Emile his philosophy of education clearly stated when he said "Everything is good as it comes from the hands of the author of nature, everything degenerates in the hands of man". He said about three kinds of teachers nature, man and things co-operating with one another. (8) Emile, the imaginary character of student, is taken away from home and reared and educated in the country side from the 'din and bustle' of the city life, because cities are the graves of the human species". Little children are supposed to get involved in activity and learn from their own experience .So he declared "There must be no other book than the world ..... And no other instruction than real facts (9). Since whatever is natural is good so for natural man education also should be natural. Rousseau's view shows that the term nature has been used in three senses. The first meaning of nature is phenomenal. He felt that child's fullest development is possible only in natural surroundings far-away from the turmoil

of city or town. A child learns much more from the nature. The plants, the river, the hills, the open sky can teach a man much more than education he received from his teacher".

The second meaning of nature is a social one – the convention of the society. Education should be based on the knowledge of the true nature of man and not on the convention.

In the third sense Rousseau talked about psychological nature. This means instincts, emotions, impulses etc. Again it means all raw material of character which should "be developed freely form all sorts of social man-made taboos". (10) Rousseau's influence had everlasting influence on later educators like Pestalozzi, Herbart, Froebel, Spencer, Montessori, Dewey and others. All the later educationists were inspired by his educational doctrines. Froebel was the founder of kindergarten system which literally means "A Garden of children" at Blankenburg. He considered nature as mysterious and symbolic. So in his school 'Nature Study' was introduced. This till now play an important role in schools. He wanted the children to learn about nature as life. They should learn about plant and animal life, the function of different organs in detail. The exploration of such mystic mature is possible through science and mathematics. Children will learn thorough exploration of the mystic nature.

According to him "Spirit and religion are inseparable. Similarly inseparable are mind and mathematics. God is the greatest mathematician..... Mathematics is the greatest expression of the laws of life.(11)

Sri Aurobinda also praised highly for the ancient system of education where the students had to grow in close proximity with nature because all human beings were considered as a 'homogenous part of nature'. Sri Aurovinda was like Rabindranath for the revibal of Ashramic System of education, and Brahmacharya is a very important period of student life.

The International Center of Education of Sri Aurovindo is truly international because students from all countries are admitted here and education is given in their mother tongue, cultures of different regions of earth is represented here not merely intellectually, in ideas, theories, principles, and languages, but in habits and customs in art, under all forms of painting, sculpture, music, architecture, decoration and physically too through natural scenery, games, sports, industries and food. (12)

Rabindranath Tagore believed in Upanishadic philosophy which said "Ekameva-dwitiyam (There is one God and no second)", "Sarvam khalividam Brahma" the universe is pervaded by one self-conscious spirit that manifests itself in and through the kingdom of man and nature"(13). Because of this belief he developed love and respect for every creature of God. He said "the feeling of separateness of being different is an illusion caused by ignorance".(14)

A wise person can realize the interconnectedness in the whole creation and the creator (universe). This is the basis of Tagor's naturalism, humanism and internationalism on which again is based his philosophy of Education. His view was education should be regarded as natural process of development and should be executed in a natural surrounding "far from the madding crowds ignoble strife" (15). He felt that " In and through the phenomenal nature, with the trees and open sky a child can learn better; his assimilation of ideas can take place freely. He can learn from natural surrounding the lesson of unity in creation." (16) Beautiful nature gives happiness, peace of mind and develops a desire for creative thinking and activity. In the process the mystic universal soul is gradually revealed, the realization of which is the ultimate aim of human life. The poet felt that man must realize his kinship with nature as he must realize nature's kinship with human beings". He regretted that the modern education "has taken us away from our natural surroundings and has weaned us from nature and its vitalizing and life giving influences". (17) He said "we rob the child of his earth to teach him Geography, of language to teach him Grammar". His hunger is for the Epic, but he is supplied with chronicles of facts and dates. He was born in the human world but is banished into the world of living gramophones". (18)

His most notable contribution to education was the foundation of Shantiniketan, Sriniketan and Viswabharati where environment was given great importance. He introduced open-air classes and double-shift system suitable for tropical climate. Broad-based curriculum is encouraged which include instruction in language, literature, science, music, dancing, painting, sculpture, crafts and various other useful subjects. Here full scope is given for development of

individual tastes and aptitudes. For Tagore religion means "passionate yearning for the infinite, a joyous realization of the infinite." And he wanted this passion should be realized by removing the sense of want and from total union with nature.(19) So he introduced seasonal festival such as autumn and monsoon festival, tree planting etc. Felling of tree were not considered serious problem those days. But Rabindranath Tagore had observed uncontrolled cutting of trees in the forest followed by slow ecological crisis and he lamented "দাও ফিরে সে অরণ্য", "Give me back my forest." He had foreseen the need for trees because trees generates oxygen, fresh air, brings rain, gives shades in summer, tees are needed for future generations. In praise of Trees he said (William Redice's translation of 'Tree'), "O tree. Life founder .....your brought feeling to harsh, impassive desert". He wrote a number of poems and songs about trees, some of which were written in connection with the annual Briksha-ropan (tree planting) festival. It is a fact that Rabindranath Tagore was the first person who formerly started Briksha-ropan at Shanitniketan in April 1925 in the north-east corner of uttaryan (20). Rabindranath Tagore passed away on 22nd shravan and this day is observed as Briksharopan. It marks the beginning of a new life". From 1942 Brikshropan is being held on hravan 22nd at different places each year, along with song and dance. The sapling brought in a procession in a Palki (Paianquin) is planted by the chief guest. The main song of this ceremony is 'Moru Vijauer Ketan Urao' and the five students symbolizing kshiti (earth), app (water), tej(fire), marut (wind) and vyom (sky) known as panchbhut (five elements of nature), bless the sapling with Sanskrit Mantras.(21)

'Haladharan' function is held every year, in 'Sriniketan' after Briksharopan ceremony This function was first held in Ashar (July) in 1928 under the name 'Sitayana'. The line on the farminh field created by the plough is called "Sita". Pandit Bidhushekhar Shastri had presided over "Sitayana". 'Haladhikaran" was done by Tagore himself. Many well known persons helped Tagore to organize the function such as Leonard K.Elmhearst, painter Nandalal Bose who painted a fresco of this function .The fresco is still preserved in Sriniketan.(22). Sriniketan is the instilute of 'Rural-reconstruction', the Rural Farm', the siksha-Sastra. Accorking to poet 'out center of culture should not only be the center of intellectual life of India, but the center of

culture of her economic life also. It must cultivate land, breed cattle, to feed itself and its students, it must produce all necessaries, devising the best means and using the best materials, calling science to its aid' (23) Tagore wanted to encourage farmers and give them status in society by Haladhikarana function which begins with a procession consisting of bullocks, farmers, students and staff of the agriculture section of Viswa Bharati. The function is performed with a plough and the bullocks. Tagore composed the song for this function 'Phire-chal Matir Tane' and 'Amra chash kari anande'. On this occasion saplings are presented to farmers.(24)

The poet wrote number of songs and poems on each of the seasons. In Shantiniketan Basanto-utsav (Spring festival), Pous Mela (autumn festival), Barshamangal (Monsoon festival) and all kind of seasonal festivals were organized every year. Poet's favorite season was monsoon so he wrote most of the songs and poems on this season. Among all the educators he is the first person who emphasized nature and did some practical work regarding this. He is aptly called "a social reformer, a scientist and a veritable man of action (25). All the great educators showed us the way how materialistic attitude could be sublimated in a desirable ways, how to bring reconciliation between tradition and modernity. From the very infancy, fondness for plants, animals should be inculcated in the children's mind through the development of their power of observation and training of their sense-organs.

An environment awareness programme in the form of seminar, exhibition, slide show, using epidiascope and projector, some exposition could be organized by all the schools and colleges.

This awareness programme could be thrown open for the public also. On different issues the environment awareness progrmme could be held. Issues could be a) deforestation b) conversion of lands for construction and human settlement c) merits and demerits of dams and barrages d) population explosion e)regenerating forests f)proper planning of policies to restore the natural environment.

Through these issues the students as well as the common people will be aware of our natural resources. They will be aware of the fact that exploitation of this natural resources will

bring global ecological crisis and lastly they will get some knowledge of conservation of animals and forests. Without this we cannot survive. At preent we observe all the environmental problems are global and complex in nature. One cannot solve the problems simply.

In August 1989 'Ecology 89' conference was held. Many surveying representatives from international organizations attended the meeting.

Representatives came from

(a) United Nations Economic Commission for Europe (ECE)

(b) European Environment Bureau (EEB)

(c) European Trade Union Confederation (ERUC)

(d) United National Food and Agriculture Organization (FAO)

(e) Green Peace

(f) International Labour organization (ILO)

(g) Organization for Economic Co-operation and Development (OECD)

(h) United Nations Environment Programme (UNEP)

(i) World Health Organization (WHO)

(j) World Bank

All these organizations gave their own viewpoint regarding environmental pollution and pointed out that those areas should get priorities where the environmental risks are greatest.

Summary of the these organizations views are:-

(a) There is a loss of valuable plant and animal specie.

(b) Depletion of the stratospheric ozone layer.

(c) Pollution by hazardous chemicals and processes and wastes.

(d) Acidification of soils and water.

(e) Deforestation.

(f) Desertification

(g) Eutrophication of wastes.

(h) Degradation of land resource.(27)

Some measures were also suggested such as :-

For future environmental work the Govt. of all the countries, specially developing countries, should improve the work-environment, should develop environmental awareness among people, should see that companies and authorities in order recruiting motivated persons who would work for the upkeep of environment. The Govt. should also strengthen international co-operation and agreement for the development of environment world.

Our country is full of wildlife and habitats, full of natural beauty and scenario and these are to be saved. Though some steps were taken but the Central and State Administration are not fully enforcing environmental protection work. There is still communication gap between the scientists and engineer, planner and decision makers. In many cases the political interference and vested interests of the people are hindering the environmental protection programme. Serious work in this regard could be taken up by the Govt. through strong administrative procedure. 'Representative from different sectors such as large-number of public-sectors research, education, communications, industrial production, public construction, consumptions municipalities, scientists, engineers, planners together could be invited to make a 'joint community environmental council.' There time to time experts in environmental issues could be invited to discuss on any particular environmental policy of programme. In this way integrated socio-economic or environmental planning could be effectively done.' (29)

Environmental Education could be given through formal and informal method Formal education, requires that the environmental education should be brought under school/college curriculum and we all are aware of the fact that U.G.C. has already introduced the subject 'Environmental Studies' in the curriculum for higher education.

But Environment awareness programme or campaigns field study, exhibitions, rallies are called informal education. It is to be mentioned that W.W.F. India started the Nature Club of India movement from 1976. Here I would like to quote from Col. S.R. Banerjee's talk no environmental issues. The formal and informal education can include environmental education in all subjects. For example, the reasons of desertification can be highlighted while teaching

Mahenjodaro Excavations in History, or poets imagination on bird calls can be used to teach the usefulness of our avian play in nature while teaching English. Formal visits to scientific organizations such as Botanical Survey of India, Zoological Survey of India, Department of forests, Agro-based Scientific Bodies. Pollution Control Board etc. will enhance the knowledge of the students. By interaction with such bodies, the students can also receive career counselling to choose environment as career. Various projects may be included for class-room study.(30)

Lastly it can be said for any environmental project a broad target group including teachers and students from primary, secondary and college level, municipal employees, scientists and common people should be invited because broadening of public participation is regarded as invaluable part of environment education awareness.

In this matter a very appropriate idea of Fritjof Capra can be quoted- "Ecological awareness is an intuitive awareness of oneness of all life, the interdependence of its multiple manifestations and its cycles of change and transformation. Such an awareness can also be called spiritual awareness (because) spirituality. It is the mode of consciousness in which we feel connected to the cosmos as a whole."(31)

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Curricular & Cocurricular Interventions In Implementation Of Environmental Education In West Bengal

Sridevi Dasgupta, Nilanjan Bala,
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DEFINITION:

Environment is the sum of all social, economical, biological, physical or chemical factors, which constitute the surroundings of man, who is both creator and moulder of his environment. Environment refers to the sum total of conditions, which surround man at a given point in space and time. Environment is representative of physical components of the earth where in man is the important factor influencing his environment.

Due to scientific and industrial revolution there has been immense impact of man on his environment. Huge industrial installations every year, introduction of faster mode of transport and sprouting up of large crowded cities (Urbanization) are the main outcomes of the modern civilization, which is contributing to environmental pollution. Increasing industrialization is also causing much danger to man's life because it is also responsible for fouling or polluting of environment by man.

Mankind will perish if the protection of the environment does not become an integral part of all the development programmes because we cannot cheat the "Mother Nature."

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COMPONENTS:

Environment can be conveniently divided into two categories.

1.N atural Environment.

2.M an-made Environment.

1.Natural Environment consist of mainly two components:

A. Abiotic or Non-Living components.

B. Biotic or Living components

Man, the most powerful environmental agent, spearheaded by modern technologies is capable of modifying the environment according to his needs to a great extent without taking account its consequences.

PRESENT SCENARIO :

The need of the day to improve our environment is to have a control on the unlimited use of our natural resources as well as to induce a healthy environment in the society. For this proper planning and management of resources as well as the environmental impact assessment should be done. Every person of the country should be aware of the consequences of changed environmental conditions. It is important to safe guard our environment which in turn safeguards the living beings.

INTERNATIONAL AND NATIONAL INTERVENTIONS :

Environmental consciousness has been a major theme of global deliberations and discussions in the post 1970 scenario.

1. In the year 1971, a conference was organized by UN or Human Environment in Stockholm. It resulted in the creation of UNEP (United Nations Environmental Programme) and also laid the foundation for cooperative effort in creating International Environmental Awareness.
2. May, 1986, Government of India passed the Environment Protection Bill, which later on became an Act.

If humanity has to survive consciousness about environment and must prevail as a crucial imperative. Environmental education has emerged as an integral part of education at all levels, particularly at the School Level. Several proactive individuals and groups voiced their concern for the need of Environmental Education as a compulsory subject at all levels of education so that it may lead to meaningful and effective environment friendly attitudes and corrective actions.

The Hon'ble Supreme Court of India in its historic judgment of 18th December, 2003 directed the NCERT to prepare model syllabi of Environmental Education as a compulsory subject for implementation throughout the country. NCERT responded instantaneously leading to the formation of Environment Education Group within NCERT with the active support of four Regional Institutes of Education at Ajmer, Bhopal, Bhubaneswar and Mysore.

PERSPECTIVE OF ENVIROMENTAL EDUCATION IN SCHOOLS :

1. SCOPE AND DIMENSIONS OF ENVIROMNETAL EDUCATION AT ELEMENTARY, SECONDARY AND HIGHER ECONDARY LEVELS OF SCHOOL EDUCATION

The main focus of EE is to expose students to the actual World they live in. For this curriculum could be based on three common aspects:

a)L earning about the environment

b) Learning through the environment – a systematic exploration through a variety of activities

c)L earning for the environment for its protection and preservation.

The scopes and dimensions of EE as emerged out from NCERT's guidelines are as follows:

a)El ementary level:

Coverage to be related to the child's surroundings, health and hygiene alone with suitable field activities and observations.

b) Secondary Level:

Moderate exposure to various environmental concepts, plant and animal life, their interaction with the environment, pollution and other problems given

c)H igher Secondary:

Greater exposure to all the topics covered at the previous level.

Concrete examples could be given through components in the Physical Sciences and Life Sciences.

The main purpose of EE is to acquaint and sensitize the young minds to the environmental problems and concerns, to inculcate in them healthy personal and social attitudes and behaviour towards environment.

2.CONTENT AND PROCESS INCLUDING PROJECTS AND ACTIVITIES FOR ENVIRONMENTAL EDUCATION (EE)

There has been a nationwide commonality regarding the major concerns and issues of EE. These include:

a)C oncept and Meaning of Environment

b) Components of Environment

c)N atural Resources

d) Pollution and related problems

e)C urrent Environmental concerns and inter dependence between man and nature

f) Energy Management

g)T oxicology

h)H ealth hazards

i) Agriculture and Environment Ecology/ Ecosystem

j) Bio-technology and Environment

k) Sustainable Development

l) Sustainable Agriculture

m) Environmental policies and legal provision

n)P opulation and development and the quality of life.

Topics suggested for inclusion in the syllabi are as given below:

a)M arine Life

b) Inter-dependence of man and environment

c)E nvironmental degradation

d) Environmental problems and hazards

e)E nvironmental pollution- air, water, soil, noise

f) Waste Management

g)Disaster Management

h)Protection of human health conditions and quality of life

i) Conservation of Energy, Soil, Wild Life, Forests, Water

j) Renewable Resources

k) Eco-friendly and indigenous technologies

l) Water resource management

m) Sustainable development

n)Sustainable agriculture

o) Environmentally sound management of biotechnology

p) Environmental policies and programmes

q) Environmental information resources

r) Acts, laws and regulations

s) Role of government and non- government agencies.

t) Biological diversity

u)Natural Resources (flora, fauna, air, water, land, minerals)

EE is not merely the transfer of knowledge, it is an approach to learning by providing direct exposure to the environment using active, hands-on-discovery method with emphasis on learning by doing, exploring and problem solving.

Process:

Some of the common field based projects and activities suggested by NCERT are:

a)Segregation of waste

b) Vermi composting

c)Safe dumping

d) Safe Sewage disposal

e)Rainwater harvesting

f) Testing of Water Quality

g)Tree plantation and maintenance of school garden

h)Protection of plants of medicinal and economic values

3. MODALITIES OF INTRODUCING EE WITHOUT INCREASING CURRICULAR LOAD.

A large number of modalities have been suggested which include:

a) Narration of events, experiences and stories

b) Assignments and projects

c) Field trips and visits

d) Establishing Eco clubs

e) Field studies and surveys

f) Brain storming and Quizzes

g) Role play and drama

h) Case studies

i) Discussions

4. EE AS AN INSTRUMENT FOR INCULCATING HEALTHY PERSONAL AND SOCIAL ATTITUDES TOWARDS ENVIRONMENT AND DEVELOPMENT

Development of healthy personal and social attitudes in learners will go a long way towards environmental sustenance building a vigilant society and promoting a sustainable development a well as maintaining a standard of health, hygiene and sanitation.

EE is viewed as an effective instrument for creating civic consciousness among learners. A focus on social environment would lead to better and healthier relationships, which is very vital to human survival and development. School projects and activities could be used for this purpose.

5. ROLE OF COMMUNITY IN IMPARTING EFFECTIVE EE IN SCHOOLS

Partnership between school, family and community needs to be established and strengthened especially in the following areas:

a)U nderstanding the Local environmental problems and finding out their solutions

b) Keeping the local environment clean and healthy

c)U sing natural resources in a judicious manner

d) Sensitizing the community about environmental conservation and protection activities

The community can contribute in the following areas:

a)S haring knowledge and information and participating in actions related to environmental improvement

b) Sharing basic resources- material and human

c)J oining hands in cleanliness campaigns

d) Celebrating festivals, national and international day functions

e)S upporting and participating in nature clubs fairs, cultural and social activities

f) Participating in meetings and forums to ensure consideration of community needs

g)M onitoring of water and air quality etc.

h)C reating awareness about the legal provisions for environmental protection

INTRODUCTION OF ENVIRONMENTAL EDUCATION IN SCHOOLS OF WEST BENGAL

A) HIGHER SCECONDARY LEVEL

The Council has taken the following steps to introduce Environmental Education in Schools:

a)C ouncil has adopted the syllabus prepared by NCERT

b) Preparation of books as per syllabus is going on

c)A n-Expert Committee has been constituted for implementation of the syllabus

d) Discussion is on for amendment of Admission Regulations and Examination Regulations in connection with inclusion of EE as a compulsory subject.

e)A ttention of the Govt. has been drawn for creation of teaching posts for EE in High Secondary Schools

B) SECONDARY LEVEL

Environmental studies will be introduced in class VI from the coming academic session beginning May 2005. Emphasis has been laid on hand- on activities in this field.

C) PRIMARY LEVEL

Environmental education at the basic level is being taught at the primary level.

GLOBE PROGRAM

Global Learning and Observations to Benefit the Environment (GLOBE) is a hands-on international environmental science and education program. It links students, teachers and the scientific research community in an effort to learn more about our environment through student data collection and observation.

GOALS OF GLOBE:

A) To enhance the environmental awareness of individuals throughout the world
B) To contribute to scientific understanding of the Earth
C) To help all students reach higher levels of achievement in science and mathematics

SIX KEY EDUCATIONAL ELEMENTS OF THE GLOBE PROGRAM:

A) Selecting local study and sample sites
B) Taking measurements carefully on a regular schedule with the help of the teachers
C) Submitting the data to the GLOBE student Data Server
D) Completing the learning activities and sharing it with GLOBE teachers

E) Using GLOBE systems on the internet to explore and communicate

F) Promoting student investigation

DOMAINS OF GLOBE SCIENTIFIC RESEARCH:

There are currently four domains of Globe Scientific Research

A) **Atmosphere** –Students conduct daily measurements of cloud air temperature, precipitation and its pH

B) **Hydrology**- Students do weekly measurements of water transparency, temperature, dissolved oxygen, pH either conductivity or salinity, alkalinity and nitrate- nitrogen of a water body near the school

C) **Soil**- Students expose a soil profile, take soil samples and analyse them to determine the characteristics of various soil layers. They also will do daily to monthly measurements of soil measurements at various depths and locations and take weekly measurements of near surface soil temperature.

D) **Land cover/Biology**- Students study the type of land cover, measure the amount of species of vegetation. They then create a land cover type map of the study site on analysis of satellite imagery of the area and the observational data collected.

In addition to these direct investigations, there are two supportive investigations included in GLOBE

A) **GPS**- Global Positioning System, which enables one to determine the Latitude and Longitude etc.

B) **Earth as a System**- involving Seasons and Phenology

SCERT (WB) was entrusted with the task of implementing the project "Environmental Education in School System". An MoU to this effect was signed between the Government of West Bengal and Ministry of Environment and Forests, Government of India.

As a part of this program, a pilot project was taken up to train teachers of 100 schools of West Bengal and Ministry of Environment and Forests, Government of India.

As a part of this program, a pilot project was taken up to train teachers of 100 schools of West Bengal on hands-on experiments on Environmental concepts. The Indian Environmental Society (IES) was the executing agency for Hands- on –Environmental Learning.

SCERT (WB) imparted the training in two phases in collaboration with IES, Pashchim Banga Vigyan Mancha, West Bengal Board of Secondary Education and West Bengal Board of Madrasah Education.

SCERT (WB) is taking an active part in the formulation of strategy for the introduction of EE in school curricula at all stages as per the directive of the Hon'ble Supreme Court of India. Regular meetings are being held with the officials of West Bengal Board of Secondary Education, West Bengal Council of Higher Secondary Education and Association of Boards of School Education for the purpose.

Apart from the initiatives so far described in implementation of EE in the State, a unique program for promoting a healthy social environment through value-based education in the form of Life-Style Education, particularly for the Adolescents is being contemplated. The concept of Life Style Education was elaborated by the School Education Committee formed under the Chairmanship of Prof. Ranjugopal Mukherjee and the West Bengal Board of Secondary Education, WBBSE has taken measures to introduce Life- Style Education in all the secondary schools of the state. SCERT (WB) & WBBSE are presently engaged in preparation of a suitable Teachers' Manual highlighting the key concepts and strategies of implementation of Life-Style education primarily through co-curricular activities. The program is aimed at empowering students of secondary level in attaining universal human values and developing certain skills that will help them face the challenges of life.

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Environmental Studies Course at Undergraduate Level in North Bengal University : An Empirical Study

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The crisis facing the environment today is a global concern and every society is responding in a positive way to tide over the crisis. Environmental Education (EE) is one strategy to respond to this concern. UGC, of late, has made it compulsory to introduce EVS at undergraduate level. The purpose of the course is to sensitize students. The core syllabus indicated by the UGC comprises 8 units. Taking into consideration this syllabus, Universities have evolved curricula on EVS.

NBU has designed a course contained in a book entitled "*Environmental Studies for Undergraduate Degree Students*". The course is under implementation for B.A./ B.Sc./B.Com. students for the past couple of years. The present study is aimed at studying the course implementation at Sikkim Government College, Gangtok with a view to identifying specific ways in which the present course may be enriched to make in more effective. The study was limited to a sample of Arts Students in the college. A questionnaire was developed for the purpose. A sample of 60 students responded to the questionnaire. The data were analyzed using simple percentages.

The main findings are :

- Number of instructional hours for the course is to be enhanced.
- Practical component has to be included in the course.
- Issues like consumerism, food adulteration, Disaster Management need to be distinctly added to the course.'
- Introductory Unit of the course should examine the multi-disciplinary nature of the theme to act as an advance organizer for the entire course.
- Technicalities involved in curriculum should be adhered to.
- The content presentation should preferably be in conversational style.

As an alternative approach to cater to the diverse stream of students, and to modernize the teaching methods in this area, self-contained modules covering a wide range of environmental issues may be developed by the UGC and flexibility in the choice of modules could be permitted. A practical component along with a system of internal evaluation is also recommended.

Education For Healthy Environment

Prof. Amitava Mukherjee
Patha Bhavan – Vishva Bharati

Modern society is a mark of the co-efficient of higher level of expectation of the common people in all directions to maintain a new order in the life style. Somehow people are ready to earn more money or status to satisfy their more and more hungry greed without taking into cognizance of our natural world. Due to severe changes in the level of expectation, people are misusing the natural resources most unscientifically and irrationally. Today we can find an ugly, unhygienic competition to accelerate the speed of life for meeting the higher level of expectation by destroying environmental equilibrium. For the first time in his entire cultural history, man is faced with one of the most horrible ecological crisis – the problem of pollution of his environment, which, once upon a time, was pure, virgin, undisturbed, uncontaminated and basically quite hospitable for him. As a result the question of **education for environment** hence rises forth.

" Environmental pollution may be defined as the unfavourable alteration of our surroundings, wholly or largely as a by product of man's actions, through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical constitution and abundance of organisms."

There are different views regarding the origin of pollution crisis on the planet earth. Many authors like Lynn White (1967) and Ian Mc Harg (1969) had blamed Judeo Christian ethic for pollution. According to them this ethic taught man to believe that, earth was made for man to do as he wished, and thereby encouraged pollution. However this view was contradicted by Wright (1970) who pointed out that Judeo Christian religion teaches stewardship and he postulated that it is not religious belief but human greed and ignorance which have permitted our culture to develop an ecological crisis like pollution. There are some authors (Such as Southwich, 1976) who have associated the human population explosion with the pollution

problem. They postulated that with more people there has been more sewage, more solid wastes, more fuel burned, more fertilizers and insecticides being used to produce more food for hungry mouths.

A pollutant may thus be defined as anything, living or non living or any physical agent (e.g. heat, sound etc) that in its excess makes any part of the environments undesirable: - **if water,** undesirable for drinking, recreation, visual enjoyment, or as habitat for the aquatic life normal to it ; **if air** undesirable for breathing, for the condition of buildings and monuments exposed to it, or for animal and plant life; **if soil and land,** undesirable for raising food and fiber, animals, or for recreation or aesthetic enjoyment.

Two contrasting viewpoints regarding relationship of human culture to environment are frequently debated:

(1) The physical environment exerts a dominant influence on culture and civilization ("environmental determinism" see Meggers, 1954) as evidenced, for example, by the differences in human customs in arid and humid regions.

(2) The physical environment places only a minor limitation on the development of advanced human culture, as evidenced by the rather similar urbanized civilizations that have been achieved at various times in the past in a diversity of natural environments. Today the question might hence be rephrased as follows: ***-To what extend does man's continuing trouble with detoriating environment stem from the fact that his culture has indeed tended to be too independent of the natural environment?***

The history of human civilization is a saga from the time of early hunters and gatherers, through the rise and fall of a densely populated agricultural empire to the present time when large areas have once again reverted to second growth jungle- the ***concrete jungle.***

Researches on this field have clearly documented the significant impact the aboriginal peoples had on the environment and have shown that major ecological change, often to the detriment of man, is not confined to industrial societies not to the twentieth century. The use of fire and the domestication of plants and animals changed the face of the earth long before the industrial

revolution. Thus domestication freed man from direct dependence on wild nature for food, but failure to control his symbionts (especially domestic and feral grazing animals and row-crop agriculture) has resulted in widespread destruction of productive soil and vegetation.

Since, more than 75 percent of Indian population live in the villages, the problem of environmental pollution has to be addressed at this level.

The statistical picture shows:-

(1) Per capita availability of forestland in 1950-51 is 0.113 hectare and in 1998-99 is 0.071 hectare.

[Source-central statistical organization-March 2003]

(2) Per capita availability of agricultural land in 1950-51 is 0.638 hectare in 1998-99 is 0.271 hectare

(**58 %** reduction)

[Source-central statistical organization- March 2003]

(Total agricultural land ÷ total population)

(3) According to Census Indian population in 1951 is 361129622 and in 2001 is 1027015247

(Increased by **184** percent approx.)

It is clearly evident from the statistics that the rate of increase of population inversely varies with the availability of forestland and agricultural land, which is detrimental to the natural system of development. Advanced technology, chemical fertilizer and modern instruments for higher production to fulfill minimum need of people are hence required.

With the decreasing cultivable land the use of fertilizer , crop rotation, High Yield Variety seeds, irrigation etc. has been made to meet up the hunger of millions .But has it been successful ? The child malnutrition scenario in India is still precarious compared to many sub-Saharan countries.

However, the pollution of land is nearing completion. Starving mouths are still in the road. Mid Day Meal programme is luring the primary learners to school. The question of quitting the cheap and profitable measures of getting a high yield does not hence arise.

Rural energy sector is also a vital area of environmental pollution. Majority of the rural mass are using coal, firewood, cow-dung cake, the twigs and dry leaves and even straw as fuel. These are highly polluting for the rural air- which is still presumed by the citizens to be pure and healthy.

However government of India has taken many steps towards the maintenance of the same. A major achievement has been in the area of cooking energy in rural areas with the establishment of around 3.50 million family size biogas plants and 35 millon improved wood stoves. India is second only to China in these two applications. The biogas plants and improved wood stoves in use are resulting in a saving of over 16 million tones of fuel wood every year. In addition, enriched organic manure is produced from biogas plants to supplement and complement environmentally degrading chemical fertilisers amounting to 9.4 metric tones of urea equivalent per annum.

Ministry of Information & Broadcasting –Govt. of India. Report -2004)

In India there are still 59.7% of the households using fuel wood. Of it for cooking 34%, only heating 0.3%, cooking and heating 25.3%

(NSSO-National Sample Survey Organization-2000-01.)

The reason for this is fuel wood does not incur any cost for the BPL Indians. Forest reserve is being extensively exhausted for the purpose- causing serious environmental pollution. Now the question is can it be made possible to replace fuel wood by any cheaper fuel system, which would have less effect on the environmental than the present fuel system.

Water is vital for realising the full potential of the agriculture sector and country's development. Optimum development and efficient utilization of water resources, therefore, assumes great significance.

The per-capita availability of irrigation water at the national level has reduced from about 5177m³ (cubic meters) in 1951 to level of 1869m³ in 2001.
(India 2004-A reference Annual –Ministry of Information & broadcasting –Govt. of India)

A scientifically designed irrigation system is the need of the day. The rivers being polluted by industrial and domestic waste, is soon going to be nothing but sewage canals. Ground water level is falling fast due to the over use of shallow pump sets and deep tube wells. Alternative renewable, yet cheap to procure, source of irrigation water has to be thought of , planned and implemented by the government.

It is in this context that the creative or regenerative aspect rather than the preventive aspect of environmental management assumes importance in country like ours which are mostly poor and have not yet been able to procure requisite wherewithal so as to succumb to thoughtless copying of rich countries' production and technological projects in agriculture and industry. A poor nation has to avoid lustful consumption pattern and life style of western societies so as to make eco-friendly use of resources saved from imitation of western consumption pattern and life style.

The whole World has come to the room through the idiot box and other media. Man is exposed to western culture. Western style of consumption has had its toll leading to the extinction of our environment. Man is dazed by the glamour of the western life style. Money has become the fulcrum of human and humane relationship. We can just condemn ourselves saying

"Only after the last tree has been cut down,
Only after the last river has been poisoned,
Only after the last fish has been caught,
Only then you will find that money cannot be eaten".

Education for environment is the only way to make conscious the young generation about the necessity of good environment for our health. Education for environment is also essential to make slogans for the students "We will protect our environment by any means as

far a practicable/ We will make aware the people about the importance of healthy environment". Education for environment is also the only way to aware the people about the essence of ecological harmony of environment and serious effects of environmental pollution.

But there are certain pre-conditions to fulfill the goal of 'Education for environment'. In our country we are always confronting the problem of three **'P'** s- poverty, population and productivity (to meet of the scarcity of food). How to cope with these problems is a serious question. Realising the gravity of the situation and its dangerous impacts on the society we are putting our steps through different measures to overcome the crisis, that we may say, "hoping against hope". Hence education for environment would be useless until and unless the problems of poverty, population and productivity are properly addressed to.

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Education For Sustainable Development

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Introduction :

The population of India has crossed the mark of 100 crore in the year 2000. In spite of this fact, India still is in a position to feed its population because it has vast tracts of fertile agricultural land. The availability of various natural resources is also worth mentioning. But the present growth rate of population accentuated by wanton exploitation of natural resources will one day put India into a bankrupt situation. Adding to the injury will be pollution factor. So long the situation turns to be out of gear something needs to be done. The developmental procedure, both in the fields of agriculture and industry should have support system but that is to be a judicious one. If it is not done properly the future generation will be deprived of their share. So the present generation should take a balanced approach towards exploitation of natural resources. Here the need for sustainable development comes.

The concept of sustainable development is a new one. It was first popularized by the World Conservation Strategy (I.U.C.N., 1980) with the definition "development that meets the needs of the present generation without compromising the ability of the future generations to meet their own needs". This concept needs to be penetrated in the minds of Indian population because they are under grip of ignorance. They have the habit to opt for the immediate gain forgetting the long standing after effects. But that has got to be changed. The public should be made aware of the fact that the survival is endangered by unscrupulous activities of man. For this an effective policy is to be developed and the education can play a vital role here.

In the school curriculum the concept of sustainable development may be incorporated with adequate weightage. If it is done, the children will then get the chance to grow with the idea of development in consonance with the carrying capacity of nature. They will be made aware of the fact that agricultural production needs to be heightened but not at the cost of depletion of sub soil water through irrigation. The natural resources will be used in industries in

such a manner that the mines will not get empty within a few years. More, the level of technology will be such that the waste materials will not cause much harm to the environment.

Education for sustainable growth in agricultural sector :

Children from rural areas are very much accustomed with agricultural practices. They get the chance to see the intricacies of agricultural works from a very close range. This enable them to observe the environmental changes that take place as a consequence of present day agricultural practices. What they need, is to know effective solution to the problems arising from such practices and also the ways to avoid such situations in future. For their convenience such discussion may be incorporated in the school curriculum. This will allow them to have both theoretical and practical knowledge in regard to sustainable development in agriculture. The alternative approach will not be a sea change to the previous one rather it will be a blend between traditional and the present day practices.

During lean seasion dry farming system may be introduced in large scale. The crops which can grow in soil with less moisture content can be selected for farming. The traditional seeds have special ability to withstand drought. More so they are less susceptible to pests. The only problem with them is they are less productive in nature. On the other hand the high yielding varieties of seeds require water to a great extent for their growth. This is provided by pumping sub soil water. As consequence, the water table is steadily going down every year threatening a scarcity of drinking water in near future. So in order to strike a balance between production and environmental sustainability both traditional and HYV seeds may be grown in a measured way.

For irrigation, it is better not to depend much on pumps and canals to divert water from aquifers and rivers. The surface water stored in tanks is better alternative. Thus the depletion of sub soil water will be checked and the rivers will not go dry. More so, there will be scope for multiple use of these tanks through pisciculture, promotion of recreational activities and so on.

The schools in rural areas generally have large fields adjacent to the school building. The school children can make use of those fields by farming. There they can go for

experimentation by introduction of both traditional seeds and HYV seeds. They can observe keenly the growth of these crops in different manner and take note of them in their field book. Watering to the plants may be done from a nearby pond in a very controlled manner. Here too they will write down the amount of water applied to plants. Instead of chemical fertilizer, bio fertilizer can be given. The pupil will keep record of production on yearly basis.

To make an experimentation during next year there will be varying inputs like changed seeds, less water, different manure etc. That will give the opportunity to the students to see the difference in production owing to differential inputs. Thus they will be able to get an idea how to strike a balance between modern approach and the traditional one to get the optimum result without disturbing the nature substantially.

Sustainable development in industrial sector demands different education system:

The industries are generally located in urban areas. The children from urban areas are more accustomed with industrial production system. They know that for the production of any consumer article raw materials are brought from outside and get processed in the factory, finished products are then sent to the market for sale. But what they generally don't know is how the raw materials are extracted and in course of time get depleted owing to over hauling of them, that too leaving a trail of pollution in the atmosphere. To make pupil understand the better way of harnessing resources by keeping the pollution level as low as possible, things are to be explained in a simple manner in the text books that they follow in schools. They should be made aware of the fact that in industrial sector too sustainable development is a necessity.

The resources available in nature are mainly of two kinds, renewable and non-renewable. The updated data in regard to availability of these resources in India is to be made public time to time. Children and the people at large will then become conscious about their proper usage. The technocrats and engineers should give attention towards judicious use of the resources. Instead of present day technology, more sophisticated technology will harness better result if wastage during the process of production is minimized.

It is high time to shift attention from fossil fuel to non-conventional energy sources. India never had substantial petroleum reserves but had large quantity of coal reserves and of

good quality too. But owing to excess consumption of it in different thermal plants India will have to face acute paucity of it in near future. Before such situation arises, shifting towards renewable energy sources will be a wise act.

Recycling of used materials can reduce the demand for fresh raw materials. The iron scarps can easily be recycled leaving the iron ores. However, this demands adequate technology.

Biotic materials are renewable in nature. They can be used uninterruptedly in industries where there is scope for that. For example cotton and jute yarns in textile industries are not only eco friendly but they can be grown unendingly too. This is not possible in the case of synthetic yarns.

Most of the urban areas in India are under the grip of pollution owing to presence of industries and automobiles. The source of green house gases are mostly the urban centres. The rivers crossing across the cities get polluted like anything because they are treated as natural sewage.

Now this information is needed to be delivered to the students in schools. But mere delivery of facts and figures will be of little use unless and until these children are brought into active participation in the programmes. They may be given more scope for experimentation in laboratory where they will be engaged in finding alternative sources of energy. Their motivation in this direction may fetch possible result in future.

To get impressions about sophisticated machineries and production procedure, regular visit to different modern industries may be incorporated in the curriculum. Sometimes, interactions with the scientists and executives from different leading industries will also provide impetus to the school children and help to frame visions.

Conclusion :

It is clear like anything that there is no alternative to sustainable development in a country like India. Both in the spheres of agriculture and industry, development in uncontrolled manner may jeopardize the achievements. So exploitation of nature is to be done judiciously. Education in proper direction will be able to bridge the gap between development and conservation of environment. The school children with their open mind and honesty is the best

section of population to be involved in this movement. So framing of right curriculum for them is the duty of Educationists today.

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Health Protection Through Proper Environmental Education

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Knowledge of environment, health and education is a living reality of modern times. Every society is composed of a great variety of human beings with different life style. Very often various diseases break out and in many cases they prove fatal. Both in rural and urban regions of our country a large number of people of slum-areas live in very squalid surroundings. They are not very conscious about the accumulation of dust and dirt in their mattresses, furniture etc. Usually houses without proper ventilation results in the formation of unhygienic microclimate which are very comfortable and ideal habitat for allergy causing dust mites, **Dermatophagoides** sp. and other pathogens. Some diseases are congenial or hereditary and majority are caused by some pathogenic microbes like bacteria, virus, fungi, protozoa, worms etc., present in the unhealthy environment, enter into the normal functioning human health.

Now-a-days, health of ecosystem has been deteriorated in many parts of our India mainly due to lack of proper education, environmental awareness and adequate income which can lead to an unhygienic conditions where some people suffer from asthma and allergies and most of the people are suffering from different contaminated diseases like cholera, dysentery, amoebiasis etc.

The first and foremost remedy is to find out the actual solution of these problems and the introduction of proper education to the general people, specially to the slum dwellers about their environment, disease-free normal life, health and common diseases, so that they can be escaped from different contaminated or contagious diseases. Because the health status of a nation is measured by morbidity or sickness and mortality means death.

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Dignified persons on the stage in the inaugural function of the seminar (from right)

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