

JGE / 32

**INDIAN JOURNAL OF
GEOGRAPHY
AND
ENVIRONMENT**

Registration No. (ISSN 0972-7388)

Volume 7 : 2002



VIDYASAGAR UNIVERSITY
Medinipur, West Bengal, India

EDITORIAL BOARD

Internal Members

Prof. Guru Prasad Chattopadhyay (Editor-in Chief)

Ms. Sumana Bandyopadhyay, Dr. Dilip Kumar Pal, Dr. Dipendranath Das (Associate Editors)

External Members

Prof. Sunil Kumar Munsi, Prof. Manotosh Bandyopadhyay, Prof. Chittaranjan Pathak,

Prof. Rabindranath Chattopadhyay, Dr. Sunando Bandyopadhyay, Prof. Ranjan Basu

Advisory Committee

Prof. Bhudeb Ranjan Dey, Prof. Juran Krishna Sarkhel, Prof. Rajat Kanti Das.

INSTRUCTION TO AUTHORS

Theme: Indian Journal of Geography & Environment is published once a year containing original research papers on scientific and cultural aspects of geography, environment and related themes. Papers may be uni- or multi-disciplinary but should have an interdisciplinary appeal.

Submission of Articles: Publication of articles is subject to the approval of the referees. For consideration, two double-spaced typed copies of the article, on one side of A4 paper, are to be sent to the Editor-in-Chief, Indian Journal of Geography & Environment Management, Vidyasagar University, Medinipur 721102, West Bengal, India. In addition, submission of electronic text is requested in PC-formatted 1.44MB diskettes in any of the following word processing software: Word (version 97 or lower), PageMaker (version 6.5 or lower), WordPad (version 1.0), Write (version 3.0 for Windows), WordPerfect (version 5 or higher) or WordStar (version 7.0 or higher).

Manuscript Style: Manuscripts should be written in British English. They should be concise, restricted within 5000 words and generally be organised in the following order: [1] Title, [2] Full name(s) and affiliation(s) of the author(s), [3] Abstract (a *summary* of the paper) in not more than 300 words, [4] Introduction, [5] Methods, techniques, material studied and area descriptions, [6] Results and analysis, [7] Conclusions, [8] Acknowledgements, [9] References according to the style detailed below, [10] Tables, [11] Figure and Plate captions, [12] Figures and Plates.

Hierarchy of paragraph headings should follow the order of [a] bold, [b] italics and [c] normal. Tables should be constructed keeping the size of the journal in mind.

Figures: Figures should be restricted to A4 size. Line thickness, spacing and lettering of the Figures should be able to withstand reduction to 7cmx10cm. Originals, *not* photocopies, are to be submitted. Scanned images in .bmp, .tiff or .jpg formats and cartograms executed in MS Excel or PowerPoint (version 97 or lower) are acceptable.

Plates: If necessary, only B&W photographs and photomosaics can be included. Please send 10cmx15cm or larger prints on glossy paper with good contrast. Scanned images in .bmp, .tiff or .jpg formats are acceptable.

References: *In-text:* "(Author, Year)" or "Author (Year)" as applicable. Provide page reference as "(Author, Year: Pages)" or "Author (Year : Pages)" while referring to books or using quotations. Use "*et.al.*" in case of more than two authors.

End of text: JOURNALS Author(s). (Year): Title of paper. *Title of Journal in full.* Volume (Number): Pages. *E.g.:* Jasanoff, S. (1993): India at the crossroads in global environmental policy. *Global Environmental Change*. 3(1): 32-52.

EDITED BOOKS Author(s). (Year): Title of paper. In Editor(s) (ed). *Title of Book.* Publisher. Place of publication: Pages. *E.g.:* Sanyal, T. and Chakrabarti, A.K. 1995. Farakka barrage project : promises and achievements. In Chakraborty, S.C. (ed.) *Port of Calcutta: 125 Years Commemorative Volume.* Calcutta Port Trust, Calcutta: 55-58.

BOOKS Author(s). (Year): *Title of Book.* Edition (Ed.). Publisher. Place of publication: Relevant pages. *e.g.:* Pickering, K. and Owen, L.A. (1997): *An Introduction to Global Environmental Issues*, 2nd Ed, Routledge, London: 24-32.

Published by Dr. Jogendramohan Debnath, Registrar, Vidyasagar University, Medinipur, 721102, West Bengal, India and printed by Unique Phototype, 49 Guru Prasad Chaudhury Lane, Kolkata - 700 006

Price: Rs. 50 (in India) / \$ 50 (outside India)

CONTENTS

Articles

Page No.

PERSPECTIVES OF ENVIRONMENT IN
TWENTY-FIRST CENTURY

... .. Ananda Deb Mukhopadhyay ... 1

GLOBALISATION OF ENVIRONMENTAL ISSUES :
FROM STOCKHOLM TO JOHANNESBURG AND BEYOND

... .. Debnarayan Modak ... 24

DYNAMICS AND ENVIRONMENTAL IMPACTS OF CHANNEL
PLANFORMS: A STUDY OF BHAGIRATHI AND JALANGI RIVERS

... .. Ashis Sarkar ... 38

STATUS OF WOMEN IN THE COAL MINING COMMUNITIES
OF THE RANIGANJ REGION IN WEST BENAL

... .. Kuntala Lahiri-Dutt & Ira Ghosh ... 50

Short Communications

AIR POLLUTION AND HEALTH HAZARD: A BRIEF REPORT
OF OBSERVATION ON KOLKATA MEROPOLIS

... .. Mahua Chatterjee ... 65

EAST CALCUTTA WETLANDS: FROM URBAN BACKYARD
TO INTERNATIONAL ECOLOGICAL HOTSPOT

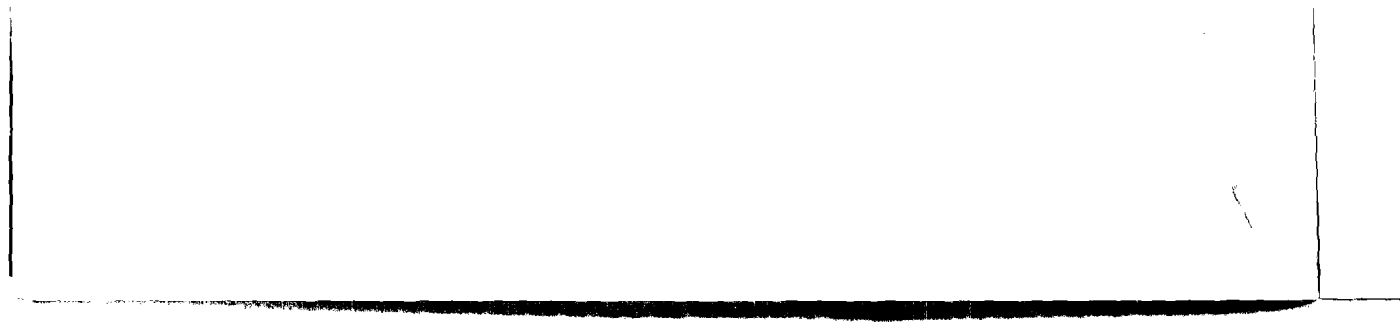
... .. Ram Kumar Bhakat ... 66

EVIDENCES OF ENVIRONMENTAL CONDITIONS OF THE
ANCIENT COASTAL CIVILIZATION OF TAMRALIPTA, WEST BENGAL

... .. Sudip Dey & Rajib De ... 69

Book Review

... 73



PERSPECTIVES OF ENVIRONMENT IN TWENTY-FIRST CENTURY

Ananda Deb Mukhopadhyay

Vidyasagar University, Medinipur 721102

Abstract

The state of global problems and issues of environment, which have taken a new dimension in this twenty first century, compared to those in the twentieth century, have been highlighted and elaborately discussed in this paper. It has been suggested that the emergence of this new dimension should be viewed on holistic ideas judging it merit from the consideration of both external and internal environmental conditions. The first perspective would be to develop a rational setting of mind for conglomeration of internal and external environment. More philosophical thinking about ethical questions related to environment has been insisted upon. In this consideration the pattern of dynamic relationships of environment with religion, natural hazards and disaster management, human right violation, natural resource management, food, nutrition and security, sustainable development and north-south divide, biotechnology, biodiversity, health and globalisation and global consumption of resources have been assessed in a concise and comprehensive manner.

Introduction:

The state of art of global problems and issues of environment (Table 1) has to be properly understood in order to highlight the perspectives of Environment (ENV) in the Twenty-first Century. A deep probe into such problems and issues would clearly show that twentieth century was the century for identifying the problems and issues, attempting global co-operation for its solutions and creating awareness among public. The last two decades of twentieth century witnessed hot debate on population, poverty and development. The solution of Environmental Problems (ENVP) remained unfulfilled. The greatest impact on the environment is created by high consumerism of the North by its life style and quality of life. The rich countries of the North are evading their responsibilities for degrading the global environment through exclusive consumerism. The stumbling block in establishing global understanding is the lack of willingness of the North for transfer of technology not only for development but also for combating environmental degradation in poor Southern Countries.

Prof. Dr. Ananda Deb Mukhopadhyay, Vice-chancellor, Vidyasagar University, Medinipur 721102
E-mail: vidya295@sancharnet.in

Perspectives of Environment*Holistic Environment*

Environment should not be viewed by scientists from the sectoral ideas of individual disciplines but on holistic ideas. The fact remains that science emerges from scientific temper. 'Scientific Temper' means rational mind-set. Bertrand Russell said, "The mind is a strange machine which combine the material offered to it in most astonishing way". Thus Twenty-first Century's first perspective of ENV would be to develop a rational mind-set for conglomeration of internal and external environment. Whatever global exercises are carried out with regard to environmental paradigm are arising out of its concern for deterioration of external environment. The internal environment, which is concerned with the ethics and value system, is less taken care off. "Ethics" is a branch of philosophy. One can project it as a "Moral Philosophy" or "Philosophical Thinking" about Morality. So far as internal environment is concerned we need more philosophical thinking about ethical questions related to environment. In exemplifying ethical thinking Socrates appealed to a general moral rule or principle which upon reflection he and his friend Crito accepted as valid that:

- (a) We ought never to harm anyone;
- (b) We ought to keep our promises;
- (c) We ought to respect our parents and teachers (one's Society or State is usually one's parent or teacher).

Socrates said considering the Ethical thinking:

"If I escape I would harm the State and would violate State's Laws"

"If I escape I will be breaking promises" and

"If I escape I will be disobeying my State and Society".

A proper approach can be made for solving global problems and issues if all the ethical thinking, principles and considerations are viewed in relations to environmental perspectives. If the Ethical thinking advocated by Socrates and accepted by Crito "We ought never to harm anyone" is prevalent in our holistic environmental concept, can one country dump its hazardous waste in another country or can the rich countries emit Green House Gases (GHGs) on a greater level than that agreed upon in Climate Change Convention? If "we ought to keep our promises" why then the polluter countries are evading payment for environmental protection measures? All these point to lack of holistic global environmental thinking where exercise of ethical thinking and value system are lacking.

Table 1: Environmental trends

Characterisation	Tendency 1972–1990	Scenario 2030
Consumption of primary biological production.	Increase of consumption: 40% on land, 25% global (estimate of 1985).	Increase of consumption: 80-85% on land, 50-60% global (the year 2030)
Change of Green House Gas concentration in the atmosphere.	Increase of Green House Gas concentration from tenths of a % to a few percent annually.	Concentration growth and acceleration of CO ₂ and CH ₄ due to accelerated destruction of the biota.
Ozone layer depletion, an increase of the ozone hole over Antarctica.	Ozone layer depletion by 1-2% annually, annual growth of ozone hole area.	Preservation of the tendency even if chlorofluorocarbon emissions are cancelled.
Forest, particularly tropical forest, area reduction.	Reduction rate from 117 (1989) to 180+20 thousand sq.km. (1989) per year; ratio between forest restoration and forest cutting of 1 : 10.	Preservation of the tendency; reduction of tropical forest area from 18 (1990) to 9-11 million sq.km. (2030); reduction of forest area in the temperate belt where forest diseases will increase.
Desertification	Expansion of desert area (60000 sq.km. per year).	Preservation of the tendency, its possible growth due to decrease of water cycle on land.
Degradation of land	Increase of erosion (24 billion tonnes annually); fertility decrease; pollutant accumulation, acidification, salinization.	Preservation of the tendency, possible growth due to decrease of water cycle on land
Ocean level rise	A 1-2 mm/year ocean level rise.	Preservation of the tendency, possible increase and acceleration of ocean level rise up to 7mm/year
Disappearance of species	Rapid disappearance of species	The tendency can be enhanced as the biosphere is destroyed; a 25% reduction by the year 2050
Qualitative exhaustion of land waters.	Increase of sewage volums, point and areal pollution sources, the number of pollutants.	Preservation and increase of the tendencies.
Accumulation of pollutants in media and organisms	Increased accumulation of the mass and number of pollutants in media and organisms; growth of the radioactive medium.	Preservation and possible enhancement of the tendencies.
Detoriation of living conditions of humans, increase of diseases and diseases relevant to ecological disturbances, appearance of new diseases.	Increase of poverty: food shortage, high infantile death rate, high level of illness, lack of pure drinking water in developing countries, living in badly polluted zones, increase of genetic diseases, increased number of still-birth and premature birth cases, high number of accidents, increased medicines consumption, increase of allergic sicknesses in developed world and of AIDS throughout the world.	Preservation of the tendencies, increase of food shortage, growth of genetic diseases and those due to ecological disturbances, expansion of infectious disease areas, appearance of new diseases.

Environment and Religion

An important ENV perspective is rational understanding about religion as one of the greatest environmental problems of this Century is religious fanaticism. Let us see what different religions speak about environment. The relationship between religion and environment can be highlighted with the following salient aspects of environment as conceived in different religion (Mukhopadhyay, 2001) :

- (i) The Hinduism says "The Earth is our mother and we are all her children". Atharvaveda contains "Let there be peace in the sky and in the atmosphere, peace in plant world and in the forest, let the cosmic powers be peaceful".
- (ii) The founder of Sikhism Guru Nanak said, "Air is the vital force, Water the progenitor, the vast Earth mother of all". In Guru Granth Sahib it was said "Human beings are composed of five elements of nature - Earth teaches us patience and love, Air teaches us mobility and liberty, Fire teaches us warmth and courage, Sky teaches us equality and broad-mindedness, Water teaches us purity and cleanliness".
- (iii) In the newest religion Bahai, there is caution with regard to relationship between humankind and nature and also between civilisation and environment.
- (iv) From Quran we found "Whoever plant a tree and diligently looks after until it matures and bear fruit is rewarded".
- (v) Pope John Paul remarked, "We shall have to change our life style for sustainable environment". This is the word of caution against high consumerism by rich North.

The above-mentioned relationships between religion and environment clearly point to oneness of all religions so far as environment is concerned. In all religions Lithosphere (Earth), Biosphere (Plants, animals, human beings), Hydrosphere (Water) and Atmosphere (including Sky) the external facets of environment are conceived as peaceful, clean, sustainable environment friendly constituents. In order to counter deforestation as environmental aid we pursue plantation activities, which is also echoed in the dictum of Quran. Thus religion and environment relationship gave the emergence of a new faith - "Environment friendly society with our common future for peaceful sustainability". So far as environmental perspective is concerned all religions advocate sovereignty, peace, cleanliness and togetherness of all earthly beings. Fanaticism and fundamentalism have no place in any religion - these are contrary to the spirit of a healthy environment.

Natural Hazards and Disaster Management

Disasters (caused by natural and man-made hazards) causing environmental problems have multidimensional effects on political, economic and social sectors. Thus Twenty-first Century's ENV would take into account the different facets of disasters and would move for its mitigation through an appropriate disaster management planning. Considering the gamut of environmental problems waiting due to disasters the last decade of Twentieth Century was declared as an International Decade for Natural Disaster Reduction (IDNDR). The IDNDR Conference held at Yakohama, Japan in 1994 thus planned a strategy for safer world and recommended (Mukherjee et al. 1999) :

- (i) It is the sovereign responsibility of each country to protect its citizens from natural disasters;
- (ii) The developing, the least developed, landlocked and small island developing countries should give priority to natural disaster management strategy.
- (iii) Develop appropriate national legislations for natural and other disasters prevention, mitigation and preparedness.

During the UN Conference of Environment and Development of Rio (1992) and Yakohama Conference (1994) the recommendations for action part of disaster mitigation are :

- (i) Identification of high risk involving hazards;
- (ii) Delineation of areas to be allotted and assessment of risks arising out of the hazards;
- (iii) Constant monitoring and possible prediction of hazards whatever possible and
- (iv) Adoption of measures to reduce potential losses.

Thus for disaster mitigation measures and proper planning it is essential to formulate (a) action plan, (b) community preparedness plan and (c) post-disaster relief / rescue plan. In our country disaster management strategy is yet to be initiated, only crisis management is being done in post-disaster stage.

The social and economic progress achieved over decades of initiatives and advances in health can be significantly degraded by disasters. The economic and political conditions in several regions have aggravated social and cultural differentials and presented existent vagaries with potent opportunities for

conflicts and disasters. There is a growing realisation that disasters are natural corollaries to inconsistent development. There is a great risk when disaster is overlooked as it overlays economic crisis and political change. The past few decades of turbulent political and economic change prompted humanitarian agencies to focus attention of the world on Conflict, Chaos and Collapsing States. In this context examples may be cited as the so-called "complex emergencies" of Somalia erstwhile Yugoslavia, Liberia and the Great Lake. These are all high profile disasters creating war victims, refugees and internally displaced persons as well as destroying lives and properties of innocent people. We must remember at this stage what the great Italian Philosopher said, "The safety of people shall be the highest law". Thus the IDNDR which has concluded in 2000 without achieving its goal shall be one of the priority areas of ENV perspectives of this Century because disaster management envisages appropriate ENV perspectives with inter/multidisciplinary linkages.

The basic human rights issues arise out of the fact that there is no comprehensive enacted law to deal with the problems arising out of disaster. The enacting laws are outdated and cannot minimise misery of people. Our constitution has guaranteed the basic fundamental rights. Our country's Supreme Court has interpreted the right to life not as life to mere existence. In fact the right to life includes the right to live with human dignity i.e. the bare necessities of life such as adequate nutrition, clothing and shelter and facilities for reading, writing and expressing oneself in diverse form. During a disaster the life and property of the victims are seriously affected. As a result the fundamental rights that are affected are the rights to shelter, food and health. These basic human rights, the States are expected to protect and enforce but which are seldom found in a country in a disaster situation. Moreover the absence of legislation that offer legal remedies, right to treatment, camp insertion and rehabilitation have aggravated the plight of the disaster-affected people.

Human Rights Violation and Environment

Human Rights violation is another area of environmental concern in this country. Women's and Men's Rights are severely threatened and need special attention for the sake of eco-friendly environment.

Table 2 : Atrocities on Women in India

State	1997		1998	
	Rape	Molestation	Rape	Molestation
Andhra Pradesh	905	2,587	152	188
Assam	645	178	225	73
Arunachal Pradesh	47	31	11	4
Andaman & Nicobar Islands	9	10	1	2
Bihar	1,189	508	0	0
Chandigarh	9	8	3	3
Punjab	175	135	61	34
Delhi	458	666	136	175
Daman & Diu	1	0	0	0
Dadra & Nagar Haveli	1	1	3	1
Goa	15	16	7	5
Gujarat	296	1,019	64	157
Haryana	341	463	141	141
Himachal Pradesh	131	69	39	88
Jammu & Kashmir	163	423	24	73
Karnataka	245	1005	85	445
Kerala	573	1569	178	521
Lakshadweep	0	0	0	1
Madhya Pradesh	3,411	6,777	1,161	1,186
Maharashtra	1,206	3117	449	894
Manipur	8	12	4	7
Mizoram	49	50	17	9
Meghalaya	26	10	0	0
Nagaland	15	1	6	0
Orissa	432	1182	0	0
Pondicherry	5	14	0	7
Rajasthan	1,225	2894	391	643
Sikkim	7	32	2	9
Tamil Nadu	287	1,092	116	148
Tripura	98	93	30	13
Uttar Pradesh	1390	1975	350	297
West Bengal	824	1277	176	169

Source : Rajya Sabha Unanswered Question No. 4639, 29 July, 1998.

The issue of systematic and large-scale violations of human rights by State will be evident from Table 2. The death in police and army custody has taken an alarming shape. In fact there is a burning need for social justice along with a proper programme of implementation. The failure to formulate an acceptable law on rehabilitation of persons displaced due to large projects of dam and river-valley is another example of human rights violation, which has attained a huge environmental dimension. Women suffer most in disaster. In a Paper published by Eurostep (1996) it was said, "South-east Asia is fast emerging as the poorest, most

illiterate, the most malnourished, the least gender sensitive - indeed the most deprived region in the world." This region is plagued with conflicts in the form of colonial struggles, ethnic discord and wars (e.g. Sri Lanka and Afghanistan suffering from pro-facto internal wars. The current refugee situation in the region is also alarming. Rape and other forms of violence employed as a means of humiliating women (Table 3). The Taliban Government in Afghanistan has imposed severe restrictions on women's lives through Islamic Sharia Law causing gender discrimination. In Sri Lanka widows are treated as outcasts. Women's rights are thus hugely threatened by the existing spectra in the South-east Asia.

Table 3 : Human Rights Violations

State	1.4.95—31.3.96	1.4.96—31.3.97	1.4.97—31.3.98
Andhra Pradesh	326	481	811
Assam	106	119	198
Arunachal Pradesh	16	16	29
Andaman & Nicobar Islands	3	5	1
Bihar	1,091	2,413	3,127
Chandigarh	7	14	1
Punjab	320	384	592
Delhi	900	1,340	1
Daman & Diu	1	3	142
Dadra & Nagar Haveli	—	2	1
Goa	14	27	41
Gujarat	105	227	422
Haryana	273	525	1,082
Himachal Pradesh	35	81	166
Jammu & Kashmir	147	317	400
Karnataka	217	217	398
Kerala	201	283	490
Lakshadweep	2	4	1
Madhya Pradesh	718	932	2,555
Maharashtra	450	740	1,730
Manipur	49	81	48
Mizoram	5	4	18
Meghalaya	8	18	14
Nagaland	31	67	27
Orissa	497	708	725
Pondicherry	13	21	1
Rajasthan	448	981	1,899
Sikkim	6	2	5
Tamil Nadu	1,110	1,064	1,311
Uttar Pradesh	2,679	8,668	17,638
West Bengal	494	651	732

Source : Lok Sabha Question No. 5013, 21 July 1998 (cited by Murtidhar 2000)

UN declaration on elimination of violence against women in 1993 is stated below:

“Physical, sexual and psychological violence occurring in the family, including battering, sexual abuse of female children in the house-hold, dowry related violence, martial rape, female genital mutilation and traditional practices harmful to women, non-spousal violence and violence related to exploitation”.

Now a days domestic violence has become rampant as a violation of human rights. In such cases of violence male supremacy, ideology and conditions are the dominating factors. Two Criminal Amendment Acts in 1983 and 1986 were introduced to include violence in home and make them punishable. But to get justice under these two amended laws is a distant affair. Moreover these laws are very unhelpful when the domestic violence is not linked to dowry.

A sizeable tribal community significantly represents Indian population. Till today a large section of the tribal communities in remote areas remained virtually outside the mainstream of our social system. The basic principle of Indian Constitution is similar to the basic premise of Universal Declaration of Human Rights (UDHR) that is 'everyone is born free and equal in dignity and rights. There shall be no discrimination on grounds of religion, race, caste, gender, place of birth or any of them.' Moreover protection and advancement of tribal communities have been accepted as a national task. The ILO Convention No. 107 concerning Tribal and Semi-tribal people in Independent countries adopted in 1954 includes (i) Command of the community over its habitats, (ii) Community as a basic unit of life and (iii) Customs and traditions governing all affairs of tribals. This Convention highlighted in voluntary displacement of tribal people from their habitat. Applications of these entire legal and institutional frame in respect of human rights seems to be a new idea and basically individualistic. The set of 'legalistic' human rights in the UDHR comprises a broad spectrum including equality before law and equal protection of law. These are to be taken care of in handling cases of Tribal Communities. Another important aspect of human rights violation is in the case of Dalits. Even with the introduction of several enactments during the last five decades the enjoyment of rights by Dalits has not been qualitatively altered.

Untouchability in its classical forms known all over India, continue to exist in many parts of India. The Act and the machinery are not able to reach out the most of the victims in the villages or to alter the situation significantly. In order to force the Dalits to remain permanently tied down as helots providing agricultural and other labours. Members of these castes were denied the right to owning land or cultivating it on their own account. Rights of the Disabilities is

another burning human rights problem and this should be viewed in the light of (a) Wars and disability, (b) Crime and disability, (c) Poverty and disability and (d) Malnutrition and disability. The world community in 1981 while observing the International Year of the disabled persons observed "Full participation and equality as the central theme of disability". Now a days disability and disability related exclusion and marginalisation is a concern of UN human rights bodies.

Natural Resource Management and Environment

One of the mentionable basic concepts of ENV is "The earth is the sole living habitat and the resources are limited". How to cope with the rising population with such limited resources is the main question so far as the global environmental balance is concerned. Thus an appropriate Natural Resource Management Policy is to be enacted for a sustainable environment. In this regard special attention should be given to ocean and coastal resources besides land resources.

Twenty-first Century has been declared to witness water famine in Asia. Thus a holistic ENV perspective is the need of the hour for outlining an appropriate Water Resource Management Policy from Micro to Macro level. This policy needs to outline a water budget from Micro to Macro level. The World Water Commission, The World Water Council, The Global Water Partnership, The World Bank and various private Corporations and lending agencies over the last decade are participating in several negotiations for addressing the Global Water Crisis.

Iyer (2003) on Integrated Water Resource Planning said, "A common trend in most of the discussions ... was to proceed from projections of demand to supply-side solutions in the form of 'Water Resource Development' projects, estimate the massive investment fund needed; take note of severe limitations on the availability of financial resources with governments; point to private sector investments as the answer and stress the need for policy changes to facilitate this". Until now water resource management is most inefficiently carried out in our country. Iyer suggested it is the result of malaise like corruption, technical incompetence, lack of accountability and unplanned development. Under the existing situation the proposed inter-linking of rivers is advocated as answer to India's gigantic water resource problems. This inter-linking is in pursuance of a Supreme Court directive. But this will be a disastrous intervention in natural forcing. One must not forget as Iyer (2003) wrote "Rivers are not human artefacts; they are not pipelines to be cut, turned around, welded and rejoined".

Such an act of inter-linking rivers as announced in the Parliament "Centre plans to take up the scheme for inter-linking rivers on a 'war-footing' as a long-

term permanent solution to the recurring problem of drought" would be a great mistake. It would be contrary to the concept of appropriate Water Resource Management Strategy for India. Mention should be made as a precaution against such linkage scheme by citing the World Bank report highlighting the large-scale diversions of Arab Sea created an ecological human disaster. Pahuja (2003) thus rightly put forward the idea of "People-centred water management coupled with modern water science rather than inter-linking rivers should meet the challenge of the current situation". Any attempt for such inter-linking programmes require established data on inter-basin transfer of water, hydrologic regime of each river system. The art of rainwater harvesting and sustainable ground water use are lacking very much in our country. How then we can proceed for a water management policy without an appropriate appraisal of both surface and ground water seasonal reserve, the nature and demand of utilisation of water and the envisaged conservation mechanism. Thus ecologically sound avenues of Water Resource Management are the basic need as an important ENV perspective of this Century.

Food, Nutrition and Environmental Security

Food nutrition and environmental security are other important perspectives of ENV in the present century. Eight hundred million people in the developing countries of which 200 million children are chronically undernourished today. Paradoxically 60% of the world's poor live in the largely agrarian regions of South Asia and sub-Saharan Africa where 60% and 29% population respectively depends on agriculture for their livelihood. For most of the developing countries food self-reliance continues to be an elusive goal. Thus the real challenge of today is feeding the growing population of the world. Nutrition can be effected with more vegetables, more fruits.

Health and nutrition are fundamental to our national progress. That is why nutrition promotion is considered as a priority area for support, especially for the vulnerable segments of the population consisting of young children and pregnant and lactating mothers are very important in this regard.

The development of the culture of home nutrition gardens, community nutrition gardens, school gardens etc. is the mentionable needs of the hour. The technology of genetic modification is to be taken help for transfer of genes to cereals to increase their nutritional value.

Food security is also dependent on the level of inequality in access to food. If there is high inequality proportion of undernourished, population is bound to be high at a given level of food consumption.

Global food security is in fact a complex and difficult task depending on many international factors encompassing political, social and technical agenda. Developing countries in particular must be encouraged to lay the foundation for a long-term reforms, infrastructure, improvements and increased emphasis on agricultural research and education.

Bio-Village for Sustainable Environment

Creation of 'Bio-village' for sustainable environment is another mentionable perspective of today's ENV. This Bio-village shall be human centred, pro-nature, pro-poor, pro-women, pro-employment in nature and it shall be oriented to technology development. Moreover 'Bio-village' needs to be dependent on three major factors like Natural Resource Conservation, Poverty Eradication, Gender Justice and Gender Equity.

Biotechnology and Environment

The application of biotechnology has to be enhanced as it offers new tools for science and technology, which are environment friendly. Biotechnology has revolutionised health care technology, which constitute one of the major visions of ENV in this Century. It is worth mentioning the role of genomic to deliver next generation diagnostics and new drug vaccines for health care system.

Agro-biodiversity provides the feedstock for the breeding and biotechnology enterprises. The future of food and health security depends on such diversity. Genetic engineering technologies help move genes across sexual barriers and hence no plant or other living organism is useless as Charaka reminded us Centuries ago.

As agriculture advanced, the human food security systems began to depend not only on fewer and fewer plant species but also on a small number of varieties. Such genetic homogeneity enhanced genetic vulnerability to pests and diseases as well as to soil and climatic stresses. At the same time the habitants rich in biodiversity like forests were getting destroyed. The in-farm conservation traditions of rural communities are also giving way to monoculture, thereby accelerating the pace of gene erosion. The ongoing loss of livestock breeds, plant, land, races and varieties are a major factor affecting sustainable agricultural systems worldwide.

Sustainable Agriculture (SA) is an alternative for the outworn "green revolution" agriculture. The SA dimensions and strategic challenges is shown below (Perlas, 2003):

Table 4 : Dimension and strategic challenge

Dimension	Strategic Challenge
Ecological Soundness	"Safe pesticides", chemical fertilisers, monoculture, chemically addicted seeds, soil erosion, water scarcity, factory farming, methodological materialism (nature as a biological machine).
Associative Economies	WTO Agreement on Agricultural, "organic commercialism", lack of integration, commodity based polyculture.
Social Justice / Equity	Traditional politics of exploitation, appropriation, disempowerment.
Cultural Sensitivity	Neglect and collapse of indigenous knowledge systems and farming culture.
Holistic and more Spiritual Science	Reductionism, materialism, fragmentation.
Appropriate Technology	Co-modification and molecular reduction of humans and living nature by "environment friendly" biotechnology, non-diffusion of good technologies.
Development of full human potential	Attaining "deep sustainability", overcoming gender bias.

Biological Diversity

The nations of the world approved a Convention on Biological Diversity (CBD) at the UN Conference on Environment and Development held at Rio in 1992. The nations of the world were concerned with the rapid extinction of plant and animal species. CBD not only provides for conservation but also for sustainable and equitable utilisation. The most important environmental problem of today is that the conservers live in poverty while the utilisers experience prosperity. This prevailing condition is contrary to the equity provision of CBD and FAO's concept of Farmer's Right.

Species occurring in and around agricultural systems provide a number of "essential services" that ensure the productivity of the crops which are the main focus of our attention. As biodiversity is lost from tropical croplands there must be concern for the viability of this life support systems and so far the sustainability of the production systems themselves. But how much biodiversity do we need? How can we assess, conserve and manage it?

Climate Change and Global Warming

The predictions of climate change models indicate that there will be large-scale changes in the global climate. GHG emissions, which cause Global Warming, are inextricably linked to industrialisation and the way of life of our growing human population. Global Warming is irresistible from the perspective of the next few human generations. Thus international co-ordination across diverse countries is needed to reduce GHGs and powerful incentive is necessary for research and

development in alternative energy technology. The annual world carbon emissions are predicted to rise 9.4 billion tons within 20 Years which is 154% of 1990 levels. Petroleum use accounts for nearly half of the emissions and is projected to increase. The estimated increase in temperature at the earth's surface ranging from 1-3.50C by 2105. As a result large scale melting of ice caps will take place, which will cause Sea Level Rise to the extent of 1 foot by 2050. There will be widespread flooding of low-lying coastal areas. This would specially harm people of poorer countries that have no income to take protective measures and this would also result in displacement of people producing huge environmental refugees. Moreover changes in rainfall patterns will take place and this may cause desertification in some grain belts. The Climate Change Convention gave a call to signatory countries to stabilise their GHG emissions at 1990 level by 2000. But very few countries succeeded in meeting this requirement. In fact the rich industrialised countries emitting GHGs disproportionately are expected to bear much of the burden of reducing emissions. This is emerging as a challenging ENV perspective in the coming decades. Thus unilateral, multilateral and international control efforts are to be evolved in this regard.

Global Warming (GW) is the mother of all scares. Carbon dioxide is vitally central to industry, transportation, modern life and life in general. The remarkable centrality of carbon dioxide (mainly causing GW) points that dealing with the threat of warming fits with a great many agenda like energy efficiency, reduced dependence on oil, dissatisfaction with industrial society, international competition, governmental desire for enhanced revenues (carbon taxes) and bureaucratic desire for more power. Thus GW is a tempting issue for many groups to exploit. Moreover GW would expand the occurrence and spread of serious medical disorders. Prolonged warming can enhance production of smog and dispersion of allergens. GW can change human well being by changing weather pattern with intense floods and drought occurrences. These disasters may cause emergence of infectious diseases. Very high temperature has a role also in promoting Schistosomiasis. Malaria and Dengue fever are the two most dreadful diseases to spread due to increase in global temperature. In 1990s climate variability accentuated the appearance in humans of a lethal disease of the lungs known as hanta virus pulmonary syndrome (a new rodent-borne ailment).

Environment, Health and Globalisation

Several degradational aspects of environment cause severe health problems (Table 5). These environmental degradation are undesirable spin-off of human development activities. Globally more than 5 million chemicals have been

identified out of which more than 70,000 have been marked. There are records of damages from many of these chemicals. These chemicals enter into our body through lung (inhalation), gastro-intestinal tract (ingestion) and skin. The art of entry of different chemical element into our body needs an understanding of geo-chemical pathways of elements to man (Fig. 1) and factors affecting geo-medical conditions (Fig. 2). The different developmental projects have also degradational effects on human health and examples of such effects with reference to water related projects are enumerated in Table 6 (Sinha and Mukherjee, 2001). The gradual increase in population density and energy consumption are increasing environmental degradation, which in turn affect human health. Hence awareness in this regard is most important because the levels of understanding particularly in developing countries are in rudimentary stage.

Table 5 : Major Environmental Health Factors and their Health Effects due to Pollution

Environmental Health Factors	Associated Health Effect
Air Pollution from domestic, industrial and transport sources	Range from fatal lung cancers, through bronchitis, amphysema, asthma to general lung function impairment and eye and lung irritation
Water Pollution from disposal of domestic sewage and liquid wastes, industrial effluents	Increased transmission of water associated diseases or direct pollution effects (poisoning acute or sub-acute)
Soil Pollution through uncontrolled disposal of solid or liquid wastes	Increased transmission of soil associated disease agent; acute or sub-acute poisoning, contamination of food chains
Noise Pollution from industrial, domestic or traffic sources	Partial or total hearing loss, disturbance and irritation
Occupational exposure to toxic substances	"Occupational diseases", acute or sub-acute poisoning

Cited by Sinha & Mukherjee (1988)

Globalisation and health imperatives are now hotly debated so far as ENV perspectives are concerned. The ideology of globalisation is that of 'market forces' economics. As a result of globalisation what we see "Global and national thinking and policy are oriented towards privatisation and liberalisation and subsidisation, regulation and protection of national enterprises are frowned upon ... At the same time all countries face new international trade rules and regulations set by WTO". How do the policies associated with globalisation affect the health sector? The WHO and ILO recently warned that globalisation may considerably increase the

number of work-related diseases and injuries in this Century. Dr. Richard Halmer of WHO (Mitchel, 1999) said "In order to reduce costs, industries with their occupational hazards are being relocated to developing countries which are home to 75% of world population". Dr. Takala Chief of ILO's (op. cit) Health and Safety Programme estimated 250 million accidents in workplace each year, leading to 3,35,000 fatalities. One million people die each year from diseases caused by pollution and toxic materials and processes. One hundred thousand chemicals are in use. Of these 350 are known to be carcinogens and 3,000 are allergenic. 1160 million suffer from respiratory and cardiovascular diseases, cancer and reproductive neurological problems. Only 5-10% of workers in developing countries and 20-50% in industrialised countries have access to adequate health care.

Table 6 : Health effects and water related projects

Project	Health Effect
Tennessee valley river project, USA	Increase in malaria
Kariba hydro-electric power scheme, Zimbabwe	Increase in schistosomiasis sporadic increase in Trypanosomiasis
Gegira-Managil Irrigation Scheme, Sudan	Increase in schistosomiasis short time increase in malaria
Ord river dam, Northern Australia	Potential increase in Arboviruses
Soe dam, Ghana	Increase in Onchocerciasis
Volta dam, Ghana	Increase in schistosomiasis
Sugar estate irrigation, Tanzania	-- do --
Kainji dam, Nigeria	-- do --
Aswan high dam, Egypt/Sudan	Increase in international parasitic infections: Helminths, Protozoa
Ubolratana dam complex, Thailand	Increase in opisthorchiasis
Kisumu rice irrigation scheme, Kenya	Increase in malaria, increase in Arbovirus infections (e.g. Onyongyong fever)
Nagarjunsagar dam, India	Introduction and increase in Ganu Valgum (bone disease)
Guayama, Osajataca and Lajas valley water development scheme, Puerto Rico Lesoto water supply improvement, Southern Africa	Increase in schistosomiasis
El Bir and Foua Gleita reservoir scheme, Mauritania	No effects on the prevalence of faecal-oral or skin diseases Potential increase in schistosomiasis
Tana river basin, Kane Fisins, Yale swamp and Taveta irrigation scheme, Kenya	Potential increase in schistosomiasis
Malumfashi Agricultural Development Project, Nigeria	Increase in schistosomiasis
Sihagarind (Chao Man) dam, Thailand	Increase in malaria
Gambia Estuary barrage, Gambia	Potential increase in schistosomiasis, malaria, filariasis and enteric diseases, trypanosomiasis
St. Lucia water supply improvements, St. Lucia, Caribbean	Reduction in schistosomiasis

Cited by Sinha & Mukherjee (1988)

The Alma Ata declaration in 1978 was for "comprehensive health care for all". The protagonists of rich nations replaced this concept with the slogan for "Selective health care". In fact in 1983 and 1985 Ruenfellor Foundation and World Health Organisation in two meetings advocated the concept of "Selective health" care instead of "Primary health" care.

Globally considerable evidence exists that public health services have been reduced as a result of the policies associated with globalisation. On the other hand user charges have been introduced in an effort to reduce government spending and to enhance the market mechanism in health.

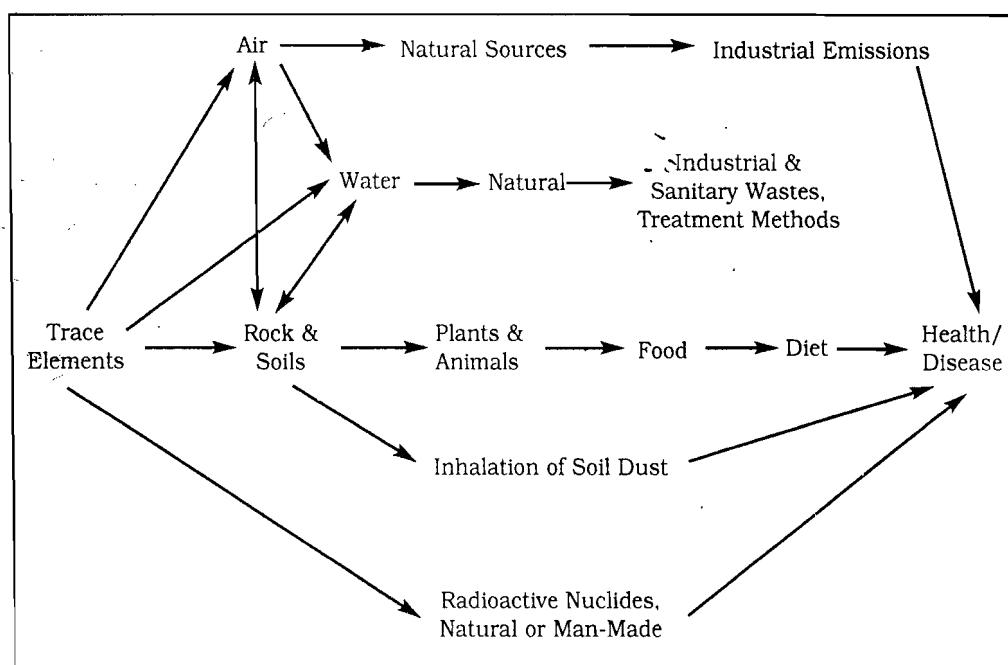


Figure 1 : Geo-medical Pathiwap of Elements to Man

As an off-shot of globalisation there is an overall reduction of government spending and this is having reflection in fall of spending on health. AIDS prevention work, leprosy control programmes and anti-smoking campaigns, these and other primary health care initiatives are particularly badly affected. Moreover privatisation of health and hospital services also makes the poor suffer, as services become more costly. There are considerable evidences, which show that public health services have been reduced as a result of policies associated with globalisation.

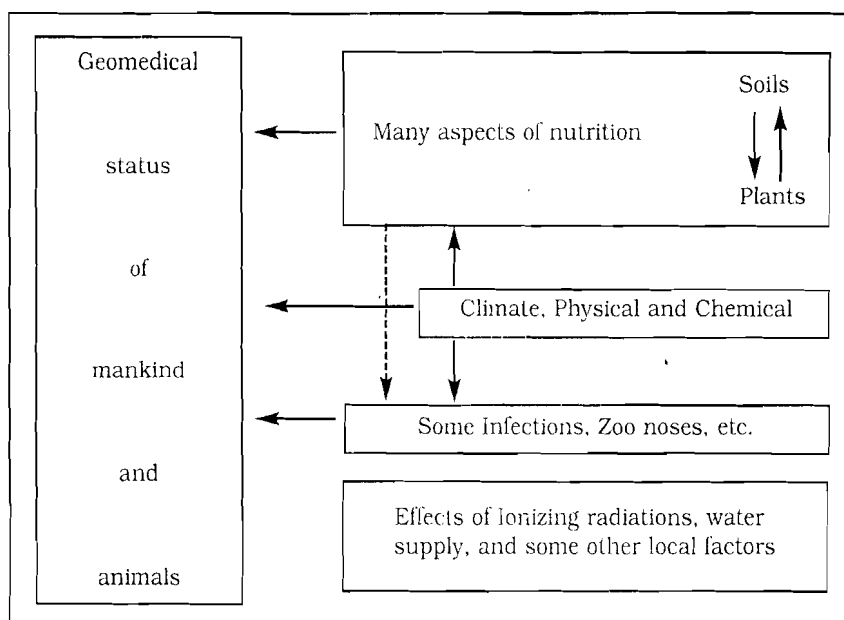


Figure 2 : Scheme Representation of factors affecting Geo-medical conditions .

The job insecurity and unemployment created by globalisation present its own health problems. On the other hand globalisation has tremendous effects on the working life and the conditions of work everywhere in the world. With the rapid changes in economic structures, technologies and demography, new occupational health needs have appeared. In many countries economic reforms led to cuts in personnel of national and city health departments and weakening of public health programmes including occupational health and health services. Free trade as a part of globalisation has already led to a number of adverse occupational health impacts.

In order to ascertain the global scenario of health the factors like (a) rate of child death, (b) availability of food, clean drinking water, (c) safe sanitation, (d) state of art of education, (e) rate of vaccination and (f) environmental scenario needs careful considerations. The Al Mata Conference in 1978 in Kazakstan in former Soviet Union set the tone for establishing people's right to health. The Conference attended by 134 countries resolved to implement health for all by 2003. But the present state of disparity in sustaining people's health in developing and developed countries is a striking feature. This disparity is politically, socially and economically unacceptable. The health policy of any country is entirely dependent on its socio-economic development. Different models are adopted for health care in different countries.

Global epidemics are threatening the health of world's people. HIV/AIDS is one of the most devastating epidemic claiming approximately 12 million lives since it started more than two decades ago. At the end of 1997 nearly 31 million are living with HIV. It is now estimated that 50 million people will live with HIV in 2005. About 16,000 people are infected by HIV epidemic each year. 90% of them are in developing countries of which 40% are women and 50% are between 14 & 15 years of age. There are 8.2 million AIDS orphan and the number will exceed 20 million by 2005. A significant impact on economics; creating shortage of skilled labour in sectors of health, education and transport has been made by HIV/AIDS epidemic. This is also adding burden to the already over-stretched health budgets.

Global Consumption and Environment

Global consumption expenditures (private and public) have doubled in the past 30 years. The past decade accelerated globalisation and has brought rapid changes in consumption patterns. The present rate of consumption growth and patterns are also damaging the environment. Moreover this present growth and patterns of consumption have deepened inequalities and social exclusion, which is detrimental to global environmental balance. In the context of global consumer market it has become difficult to defend the consumer rights to information and product safety. Industrial countries representing 15% of global population account for 76% of global consumption expenditure. One fifth of the world's population residing in the highest income countries consumes 58% of world's energy, 65% of electricity, 87% of cars, 74% of telephones, 46% of meat and 84% of paper. The share of lowest income countries in these areas is less than 10%. These inequalities in consumption pattern have created global disparity. It is a common feature that any type of human consumption activity cause environmental impact (EI) in the life cycle of the product i.e. from production to consumption to waste disposal. The EI may be summarised as:

- (i) Non-renewable resources get depleted;
- (ii) Acts of over-fishing, overexploiting forests and ground water and exposing soils to erosion cause depletion of renewable resources;
- (iii) Emission of pollutants creating unhealthy environment;
- (iv) Generation of wastes beyond the earth's natural ability and to absorb the same.

The nature and magnitude of these environmental impacts can be studied through the life cycle of a product. The environmental degradation caused by high consumerism is an important source of global poverty and deepening inequality. In addition to this the levels, patterns and growth of consumption have

substantial impacts on employment and on society also. Again the social symbolism of consumption is central to the cultural traditions of all people. There is a complex chain of link between consumption and human development. The link may either be strong creating positive impacts for many people or weak, which breaks down, and causing negative impact.

Sustainable Development and North-South Divide

Sustainable Development (SD) requires to satisfy the needs of all by extending to all the opportunity to fulfil their aspirations for a better life. SD implies integrated development. SD advocates the spirit to provide the poor with an assurance for full share of resources required to attend the growth. SD stands for all round development without causing environmental disaster. SD originates from the basic principles of (a) equity, (b) solidarity and (c) duty to co-operate for global development. The principle of equity is aimed at creating balance between converging and diverging interests of developed and developing countries. The principle of solidarity advocates for creating responsibility of any state to promote and implement adequate development policies with its sovereign rights. On the other hand the duty to co-operate for global development is aimed for co-operation in international relations in the fields of (a) International Trade, (b) International monetary and financial relations, (c) Transitional investment, (d) Transfer of Technology, (e) Supply of food, energy and commodities and (f) International protection of continuation of various activities (Mukhopadhyay, 2001). A model needs to be evolved for promoting SD linking economic, social and environmental aspects of the community for addressing ecologic integrity, economic security and social equity. SD in reality is concerned about equal considerations between - (a) economic development and environmental quality, (b) technological innovations and community stability and (c) investment in people and investment in infrastructure.

With this backdrop whether SD can be achieved is a billion-dollar question. But it is apparent that the great North-South Divide is detrimental to achieving SD locally, regionally and globally. The North is yet to take a positive approach in solution of global problems such as Climate Change, Technology Transfer, Toxic Waste Disposal, Management and Funding of Environmental Problem, Equity in Distribution and Sharing of Food, Energy etc.

North has clearly avoided discussions on its own level of consumption patterns and life style, generating excessive wastes and resulting in environmental degradation. The role of MNCs in resource depletion and pollution activities is known to all. North is not in a mood either to discuss about such activities of the

MNCs or to suggest measures for combating these activities. In UNCED North demanded environmental concessions from the South. South insisted for a commitment from North for restructuring global economic relationship. Moreover North-South divide hinges on (Mukhopadhyay, 2001) :

- (a) Issue of sovereignty Vs Global Interaction;
- (b) Control over nation's natural resources;
- (c) Managing forests and biodiversity (including Biopiracy);
- (d) Deforestation and responsibility for creating the problem of climate change and the basis for sharing it;
- (e) Role of multinational and international finance and development institutions and their decentralisation through increased participation of developing countries;
- (f) Environmental funding pattern; and
- (g) Differences on the concept of Human Rights and its applications under different socio-political systems at varied level of development.

Some years ago the developing countries demanded a UN Conference on Financing for Development. Their thinking was to review and reform the present trading and financial system which has retarded their development constraining their finances. But the outcome of the UN Conference on Financing for Development held in March, 2002 in Monterrey, Mexico, referred to as the "Monterrey Consensus" was totally different from the thinking initiated by the developing countries prior to this Conference. The outcome of the Conference maintained only the status quo rather than addressing the fundamental problems of the existing financial system and defective policies of IMF. The "Monterrey Consensus" highly emphasised trade as the only important external source of development financing. It failed to realise the fact that developing countries cannot avail of this potentiality because of the following reasons :

- (a) Many developing countries are still dependent on export commodities whose prices have been severely depressed causing financial loss;
- (b) Continuous blocking of the potential exports of South to North particularly in Agriculture and Textiles;
- (c) Imbalanced Trade rules of WTO continue to enable rich developed countries their protectionism. These developing countries face enormous problems;
- (e) Unusual surge in imports due to liberalisation is not balanced by export increase. This has caused trade deficits to developing countries;
- (f) Trade rules and Trade systems have miserably failed the developing countries.

UN Conference on Environment and Development held in 1992 at Rio put forward the concept that SD is the answer to environment and development crisis facing the earth. This spirit of Rio created great hopes for emergence of a new global partnership. But after a decade this spirit has not been able to create any global impact in North-South relations for tackling growing environmental crisis and promoting SD. The global environment continued to deteriorate. To cite examples (a) deforestation continued at a rate of 14 million hectre per year, (b) emission of GHGs to atmosphere has increased, (c) emergence of global water crisis and (d) new technologies such as genetic engineering is causing new environmental and health threats. Moreover there has been no significant progress in transfer of technology. Since Rio the rights of holders of IPR is increasing (mainly corporations of North) and the rights of public (developing countries) are decreasing in technology transfer. Thus the WTO dictated IPR regime will ultimately side track the interests and interests of communities that developed biodiversity related knowledge in forming medicine plants etc. and enabling the patenting of this knowledge by commercial companies.

It is noticed that a striking weakening of political leadership has taken place to address environmental, social or developmental issues. Northern political leaderships have given less priority to environmental and social concerns. They are promoting liberalisation and championing the interests of corporations. As pointed out by Khor (2002) there is a need for fundamental reforms of policy and practice at both national and international levels to achieve SD globally. He suggested the following proposals for change in policy and practice :

- (i) Need for appropriate and democratic global governance;
- (ii) Rebuilding the Role of UN;
- (iii) Reforming the global economic system to benefit the South;
- (iv) Reforming the WTO;
- (v) Retrieving the IPR regimes;
- (vi) Evolving rational relation-between Trade and Environment;
- (vii) Reforming the global finance system;
- (viii) Technology assessment and evolving precautionary principle;
- (ix) International environmental governance;
- (x) Quest for alternative development strategy.

The existing scenario of North-South relationship is contrary to the concept of equity, solidarity and duty to co-operate for global development, which is the basic principles of SD.

We are all intimately connected to our environment despite technological

advancement. Our lives depend on ecosystem goods such as food, timber, genetic resources and medicines. Ecosystem also provides services including water purification, flood control, coastline stabilisation, carbon sequestration, waste treatment, biodiversity conservation, maintenance of air quality and aesthetic and cultural benefits. Too little is known of the current state and future of these goods and services. Thus a system of international assessment is needed without which development will not be sustainable.

References

- Alam, A. (2003) : Linking Rivers: Would it drought proof India. *The Hindu Survey of the Environment*, 45-49.
- D' Souza (2003) : Linking Rivers: Hydraulic suicide. *The Hindu Survey of the Environment*, 25-30.
- Eurostep (1996) : Hender and Humanitarian Assessment. *Eurostep report*. 126p.
- Gujja, B. (2003) : Linking Rivers: Learn from others' mistakes. *The Hindu Survey of the Environment*, 13-18.
- ILO (1994) : *World Labour Report*. Geneva.
- Iyer, R.R. (2003) : Linking Rivers: A climax of a Project. *The Hindu Survey of the Environment*, 11-17.
- Khor, P. (2002) : Some proposals for Sustainable Development. *The Third World Resources*, No. 139/140, 14-24.
- Mitchel (1999) : The impact of globalisation on health and safety at work. *Report issued by WHO & ILO*.
- Pahuja, S. (2003) : Linking Rivers: A sustainable perspective. *The Hindu Survey of the Environment*, 19-23.
- Pelkey, N. (2003) : Linking Rivers: Cost of Behemoth. *The Hindu Survey of the Environment*, 31-37.
- Perlas, N. (2003) : Sustainable Agriculture: Seven dimensions of Sustainable Agriculture. *WTO Volume on Sustainable Agriculture*.
- Mukherjee, A. D., Sanyal, P. and Dutta, K. (1999) : *Disaster Management*. Jadavpur University Publication, 210p.
- Mukhopadhyay, A. D. (2001) : World Environment. *Keynote Address on Environment Day at Zoological Survey of India*, 1-10.
- Mukhopadhyay, A. D. (2002) : Sustainable Development and Gandhian Views. *Keynote Address in National Seminar on Sustainable Development and Gandhian Perspective*. Vidyasagar University, Medinipur
- Murlidhar, I. J. (2000) : Human Rights Issue. In *India Disaster Report*. Edited by S. Parsuraman & P. V. Unnikrishnan, 31-36.
- Sharma, S. (2003) : Linking Rivers. A dream or a mistake. *The Hindu Survey of the Environment*, 39-43.
- Sinha, D.K. and Mukherjee, A. D. (1988) : Module for Teachers on Environmental Education. *UNESCO Project. Jadavpur University Publication*, 196 p.
- Sinha, D.K. and Mukhopadhyay, A. D. (2001) : *Fundamentals of Environmental Studies*. Visva Bharati Publication, 256p.
- UNCED (1992) : UN Conference on Environment and Development. Rio de Janeiro.
- UNHCR (1998) : *The State of World Refugees*. UNHCR Publications.
- WHO (1997) : *Health and Environment in Sustainable Development*. Five years after the Summit, Geneva.

GLOBALISATION OF ENVIRONMENTAL ISSUES : FROM STOCKHOLM TO JOHANNESBURG AND BEYOND

Debnarayan Modak

*Department of Political Science with Rural Administration
Vidyasagar University, Medinipur, 721102*

Abstract

International concern for environmental management has gradually been perceived since the mid-1960s; and over the years, through successive earth summits, beginning from Stockholm (1972) to Rio (1992) and Johannesburg (2002), the 'global' character of the environmental problems, as well as the need to tackle those through collective efforts, has been universally recognised. With the passage of time, the international community has shown greater consciousness of the problems of environmental degradation and this has been reflected in the changing nature of the global agenda. Environmental concern has now definitely become the common concern of humanity and the states of the world as well as international organisations are now responding to this new kind of 'green' awareness. In spite of that, although many a path-breaking resolutions were adopted, institutional innovations made and agreements reached, through series of summits and conferences, to tackle the global environmental problems, the desired level of co-operation and policy co-ordination among the states to protect the earth from the potential danger could not be achieved so far. Keeping in view the debates and discussions over a number of environmental issues as reflected in different international forums, it reveals that the socio-economic and political aspects of the problem have come to the fore and these demand a more serious and in-depth study. In absence of a supra-national organisation, while the question of state-sovereignty expressed in terms of national interest, which is very often viewed as stumbling block to many a global environmental initiatives the unequal power-relations in the present-day world have also stood in the way of effective implementation of many of our environmental pledges. Things became more complex in view of the North-South divide in respect of the perception of environmental problems based on differences in the objective situation. Added to it, there have been the forces of economic globalisation which seems to unveil its very contradictions also in terms of ecological globalisation. Hence, doubt arises as regards the capabilities of the existing world order to take effective steps to usher in a new era of a 'global ecological order.'

Introduction

Concern for environment is a major and probably the most enduring social force since the second half of the last century and particularly since 1960s. Transcending the realm of the 'idealistic' exercise of a handful of visionaries and

Dr. Debnarayan Modak, Selection Grade Lecturer, Dept. of Political Science with Rural Administration, Vidyasagar University, Medinipur, 721102. E-mail: modakdeb@yahoo.co.uk.

also the domains of the experts in the scientific and technological fields, it has now engaged the attention of wider sections of society, notwithstanding all our fascination for modern ways of living and concomitant economic and technological development. It took the shape of a 'global' phenomenon, which intervenes not only in the industrial, scientific and technological behaviour of mankind, but also the courses of our socio-economic and political dynamics. In the fields of international relations too, despite its long attachment to the idea of 'state-sovereignty', environmental issues thrive on the agenda as the 'common concern of humanity'. Gradually, the international community has become aware of the need for taking concerted efforts to ensure a more just, secure and prosperous habitat for mankind through the protection and promotion of human environment. The increasing awareness relating to the fate of the air we breathe, the plight of the oceans as the vessels of our life, the need for protecting the forests as the lungs of our planet and many other issues of importance prompted the states of the world to come closer to each other to formulate a common strategy to protect the earth from potential dangers arising out of the various aspects of environmental degradation. This paper makes a systematic attempt to identify the important milestones in the process and seeks to point out the major policy-decisions that have been adopted to secure a more eco-friendly world. It also indicates the key areas of debates and dissensions that divide the world community making implementation of the major summit proclamations very difficult and also the reasons underlying those. In the light of some recent developments, this paper tries to make one essential point that, although the problems relating to human environment are mostly scientific and technological in character, they are basically socio-economic and political by their implications and those can not be resolved unless the world community can go beyond summit declarations and makes a breakthrough in this regard.

Environment as a 'Global' Phenomenon

To talk of environment as a global phenomenon may mean a number of different things. The meaning is also very often circumscribed by time and space sequence. Prior to the 1960s, environmental problems were more likely to arise within, rather than across, state-borders. They were often defined in scientific and technological terms and much of the debate was expert-driven and usually characterised by the absence of public concern. However, since the mid-1960s, debates on international and/or trans-boundary environmental problems have occupied the attention of the environmentalists and the governments particularly in the North. The process of 'globalisation' of environmental issues actually

started from this period and the international concern was primarily confined to the issues relating to the wilderness and wildlife conservation, maritime pollution and those related to the spread of nuclear weaponry. Over the years, however, the nature and scope of the global environmental concerns have been extended to an enormous proportion and newer issues have been incorporated in the global agenda. Today, the 'global' environmental issues refer to those problems, which are common to all peoples irrespective of their political boundaries, even though they are affected in different ways, and to different degrees, *e.g.* climate change or the hole in the ozone layer. It may also refer to the shared problems of humanity whose nature is different for different regions; the loss of bio-diversity can be cited as an example. It may again refer to such trans-boundary problems, where events that have a specific location have implication for people elsewhere in the globe. The disappearance of the rain forests or the 'export' of acid rain are examples of such category. Although many a problems relating to human environment may assume 'global' character if we go by the above categorization, experts, however, identified five specific issues: Ozone depletion, climate change, deforestation, loss of bio-diversity and desertification as matters of prime concern at the global level, which need immediate attention today. In this connection, what is to be remembered is that, in whatever manner one defines the term 'global', the consequences of modernity, industrialisation, as well as the very pattern of socio-economic and political practices have been with us since the very beginning, although they have come to widespread notice only in the last few decades.

Growth of International Concern for Environment

At the international level, concern for environmental problems is not a very old phenomenon. Environmental issues were associated long enough with the operation of the state-system. The oldest and fairly well known aspect of it was the competitive drive of the nation-states for possession of natural resources and its consequences. Apart from it, concern for environment was often expressed about the trans-border character of the problems as they were beyond the regulatory outreach of nation-states. But the environmental issues stood always in the margins and never acquired the centre-stage of international relations. Environmental issues did not figure in the agenda of the *League of Nations*, the first ever universal organisation of mankind. During the League-era, the only functional organisation related to environment was *International Labour Organisation* (ILO) though various inter-governmental public unions, and a few environmentally oriented non-governmental bodies, like *Zoological Society*, *International Council for Exploration of the Sea* were there. Again, environmental

dimension was also absent in the slated purpose of the *United Nations Organisation* (UNO) that emerged in 1945. One may, however, discern indirect implication for environmental concern from the U.N. Charter if the 'positive' notion of 'peace' is analysed in terms of its objectives. Actually, as Patricia Birnie observed, 'there was no consciousness in 1945 of any need to protect the environment, except on an *ad hoc* basis outside the U.N.' (Birnie, 1996: 327). An important event, however, was the setting up of the *International Union for Conservation of Nature and Natural Resources* (IUCN) through an international conference convened by the *United Nations Educational, Scientific and Cultural Organisation* (UNESCO) in 1949. The *U.N. Scientific Conference on the Conservation and Utilisation of Resources*, held in 1949, though limited in scope, is also noteworthy in this connection. It reveals that the environmental awareness was very low at the international level except amongst a very few non-governmental organisations during those days. John Vogler wrote: "The environment, then, was simply regarded as the unchanging context of international politics, and environmental issues the preserve of technical negotiation about fish stocks, wildlife preservation and the design of oil tankers." (Vogler, 1997: 222).

Things, however, began to change rapidly in 1960s with the advance of scientific developments and the growth of public awareness of environmental degradation. It was gradually realised that pollution, whether atmospheric or marine, knows no boundaries. Neither do many endangered species. Some states, particularly in the North, had to place the environmental issues on their political agenda and to enact some influential national legislations in this regard. They sought to replicate these national approaches in the international basis, as they perceived that the major environmental issues are to be resolved through action at the international level. The contributions of some Non-Governmental Organisations (NGOs) have been very important in this regard. Besides the works of some older organisation like the *U.S. Sierra Club*, the activities of some newly emerged pressure groups like *Greenpeace* and the *Friends of the Earth* to motivate both the governments and international organizations in this period added to the generation of a new kind of environmental awareness. Intellectual developments during the period also contributed much towards the direction. The publication of a number of seminal works including *Silent Spring* by R. Carson (Harmondsworth, 1962), *The Limits to Growth* by D. Meadows *et.al.*, (London, 1972) *The Closing Circle* by B. Commoner (New York, 1971), *This Endangered Planet* by R. Falk (Toronto, 1971) etc. had stimulated public awareness of environmental problems. Media coverage of some environmental disasters alerted the people and

governments about the potential dangers of environmental degradation. The international community started responding to this new kind of 'Green' awareness through a number of conferences on specific issues. *The Bio-sphere Conference* held in 1968 under the auspices of the UNESCO is a landmark in this connection, which recognises at the international level man's relationship with nature. In 1970, a technical conference convened by *Food and Agricultural Organisation* (FAO) drew attention to the possibly damaging effects of marine pollution and over-exploitation of the living resources of the sea. Thus, the concern at the national and local levels generated by perceived environmental degradation, finally emerged at the international level and was voiced at the floor of the United Nations, which paved the way for the recognition of environmental problems as a 'global' phenomenon.

United Nation Conference on Human Environment (UNCHE) : The Road to Stockholm

The first formal recognition of the international concern for environmental problems was the convening of the UNCHE at Stockholm (Sweden) in June 1972, in which representatives of 113 states, 19 governmental and 400 inter-governmental and non-governmental agencies assembled and expressed their concerns over the environmental problems. The immediate impetus of this first ever earth summit, which put environment on the global political agenda, was the resolution adopted by the *Economic and Social Council* (ECOSOC). [ECOSOC Res. 1346 (XLV) of 30 July 1968]. It is to be remembered that the resolution of the ECOSOC was actually a follow-up action of the *Biosphere Conference* of 1968, in which Sweden moved a proposal for holding of such a conference by the United Nations and it was agreed upon by the others. The United Nations unanimously agreed to the proposal and there started the necessary preparatory work for the conference. UNCHE's terms of reference were "to provide a framework for comprehensive consideration within the United Nations of the problems of the human environment and also to identify those aspects of it that can only, or best be solved through international agreement."(quoted in Birnie, 1996: 339).

Doubts arose regarding the success of the conference right from its preparatory stage owing to the differences of perception of nations relating to the environmental problems. Differences between the 'environmental concerns' of the developed world and the 'developmental concerns' of the developing states proved very important in this regard. Lorrain Elliot rightly observed: "Developing countries were cautious about the conference, wary that 'Northern' concerns with pollution and nature conservation would take precedence over poverty and

underdevelopment. There were tension also over issues of responsibility for environmental degradation, appropriate levels of developmental assistance, funding, technology transfer and population" (Elliot, 1998: 11). The recognition of the environment-development relationship, however, played the role of a catalytic agent facilitating the success of the UNCHE. Even in the conference, several state representatives highlighted the role of capitalism, apartheid and nuclear proliferation in environmental degradation. The U.S. and other allies responded to this by deploring the raising of such 'political' issues and asserting the sanctity of free-trade and the GATT system. Debates also took place about various aspects of environment-development relationship and about the allocation of responsibilities. It, however, recorded the important global consensus that the environmental problem was indivisible and a common problem of humanity.

Six subjects were placed on UNCHE's agenda: i) planning and management of human settlements for environmental quality; ii) environmental aspects of natural resources management; iii) identification and control of pollutants and nuisances of broad international significance; iv) educational, informational, social and cultural aspects of environmental issues; v) development and environment; and vi) international organisational implications of action proposals. The aim was to adopt a declaration on the Human Environment (Birnie, 1996: 339).

The conference drew up 26 disparate principles addressing developmental as well as environmental issues: *two* proclaimed rights; *four* related to conservation of resources, *two* to pollution; *eight* to development; *nine* to general topics; *one* called for acceptance of state responsibility for environmental damage, which are known as Stockholm Declarations (Birnie, 1996: 342-48). It was a compromise, which balanced the shared interests of states in maintaining the principles of state-sovereignty and the competing interests of developed and developing countries. It balances the importance of a global commitment to protect resources and limit pollution against the importance of economic development (Elliot, 1998: 12). The conference also made 109 specific recommendations for international action (known as the *Action Plan*) consisting of three basic components. The *first* was the establishment of a Global Assessment Programme, *Earth Watch*, which was to include a *Global Environmental Monitoring Service* (GEMS) and an *International Referral Service* (now entitled *International Referral System for Sources of Environmental Information*, better known as INFOTERRA). The *second* component concerned natural resources management : goal setting, planning, consultation, and conclusion of agreements. The *third* comprised supporting measures such as training, education and provision of information (Birnie, 1996:

342-48). The most important outcome of the Stockholm Conference was the development of a new international machinery, *United Nations Environment Programme* (UNEP) that has now become a part of the UN system. It serves the role of a catalyst in developing and coordinating all the environment-related initiatives at the global level.

Stockholm to Rio : In-between Years

A very significant trend in the post-Stockholm era has been the broadening awareness of the environmental problems and the United Nations adopted a more active role by furthering Ozone Layer protection (Montreal Protocol, 1987), regulating the disposal of hazardous waste (Basel Convention, 1989), highlighting the problem of over-fishing through producing reports on the world's fisheries by the FAO and limiting further tropical deforestation through the *Tropical Forest Action Plan*. Over the next twenty years, environmental and economic issues were debated ranging from Ozone depletion, forestry and sustainable development to climate change. Whereas the northern states like the USA have concentrated their diplomatic energies on Ozone depletion, the southern states have sought to draw wider connections between environmental destruction, poverty, debt and development (Dodds, 2000: 111). In view of the debates mentioned above, the most important development in this period was the appointment of the *World Commission on Environment and Development* (WCED), popularly known as *Brundtland Commission*, named after its Chairperson, Gro Harlem Brundtland, the Prime Minister of Norway, comprising 23 members from 22 countries to formulate 'A Global Agenda for Change'. The Commission submitted its report entitled *Our Common Future* in 1987. In its effort to do away with the age-old dichotomy between environment and development, it provided a striking balance among them. It states: "But the 'environment' is where we all live, and 'development' is what we all do in attempting to improve our lot within that abode; the two are inseparable" (WCED, 1987: xi). It identified poverty as a major cause and effect of global environmental problems and urged for a broader perspective that encompasses the factors underlying world poverty and international inequality. Coining the term 'Sustainable Development', it called upon the U.N. General Assembly to transform its conclusions into a U.N. Programme of Action on Sustainable Development and to review its progress to convene another earth summit 'to set benchmarks and maintain human progress within the guidance of human needs and natural law' (WCED, 1987: 343).

United Nations Conference on Environment and Development (UNCED) : Rio Earth Summit

The UNCED was held at Rio de Janeiro (Brazil) from 3-14 June 1992, in which 178 state representatives and over 1400 officially accredited NGOs participated. The *Rio Declaration on Environment and Development* contained 27 principles that sought to provide a balance between the priorities of developed and developing states. Its stated goal is the establishment of a new and equitable global partnership through the creation of new levels of co-operation among states, key-sectors of societies and people. *Principle 1* establishes 'human beings' at the centre of concern for sustainable development, rather than elaborating a prior and fundamental concern for protection of the planetary eco-system. *Principle 2* elaborates the states' sovereign rights over resources while reminding them of their transboundary responsibilities as well. *Principle 3* asserts the 'right to development', though very controversial in nature. *Principle 4* proclaims environmental process as an inherent part of the developmental process. *Principle 5* emphasises on the importance of eradicating poverty. *Principle 6* advocates for giving priorities to the special needs of the developing countries. *Principle 7* reinforces the common but differentiated responsibilities of developed and developing countries. *Principle 8* calls for a reduction in, and elimination of, unsustainable patterns of production and consumption and emphasises on the need for appropriate demographic policy. *Principle 9* encourages the exchange of technical know-how including adaptation and diffusion of new technologies. *Principle 10* emphasises on individuals access to information, public awareness and participation. *Principle 11* advocates participation of women, youths and indigenous communities in the pursuits for sustainable development. *Principle 12* calls for the further promotion of a 'more supportive and open international economic system.' *Principles 13-23* deal with multifarious aspects like precautionary principles in respect of adopting any cost-effective measures, 'the polluter pays principle', information and notification requirement in case of any transboundary environmental damage etc. *Principle 24* considers warfare as inherently destructive of sustainable development. *Principle 25* notes that 'peace, development and environmental protection are interdependent and indivisible'. *Principle 26* advises the states to solve their environmental disputes through pacific means. Finally, *Principle 27* calls upon the states and peoples to co-operate in good faith and in a spirit of partnership to fulfill the principles set forth in the declaration (Elliot, 1998: 20-21).

Another important document produced at Rio was *Agenda 21*, a programme covering over 100 areas ranging from alleviation of poverty to strengthening

national and international society's ability to protect the atmosphere, ocean and other waters, mountains and areas vulnerable to desertification. As a document of an unprecedented scope, it is the first international action plan, which specifically links economic development with environmental protection. It is about 800 pages document consisting of four sections, the *first* of which deals with social and economic dimension of the environmental problems and it includes chapters on combating poverty, changing consumption patterns, managing demographic dynamics, human health and human settlements. The *second* section covers environmental issues under the broad heading 'Conservation and Management of Resources for Development' and it includes chapters on atmosphere, land resources, deforestation, desertification and drought, sustainable agriculture and rural development, bio-diversity, bio-technology, oceans, freshwater resources and various aspects of waste management. Section *three* focuses the role of the major groups in the society such as the women, children, youth, indigenous peoples, NGOs, local authorities, trade union, business and industry, science and technology and farmers. The *final* section deals with the means of implementations, *i.e.* financial resources and mechanisms, technology transfer, institutional arrangements and legal instruments as well as less contentious chapters on science, education and capacity-building (Elliot, 1998: 22-23).

The *UN Framework Convention on Climate Change* (UNFCCC) and the *Convention on Biological Diversity* were the two most important documents, which were drafted just on the eve of the Rio Conference and were opened for signature in the conference. The UNFCCC's basic objective is the stabilisation of atmospheric greenhouse gas concentrations at levels that it will prevent human activities from interfering dangerously with the global climate system, within 'a time frame sufficient to allow eco-systems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to precede in a sustainable manner'. The goal is to be achieved through limiting emissions, enhancing sinks and protecting reservoirs. However, it contains no authoritative targets or deadlines in large part because of U.S. opposition with support from oil-exporting countries. The objectives of the *Convention on Biological Diversity* are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources (Elliot, 1998: 69 & 77).

The Rio-Conference, which is regarded as the world's largest Earth Summit so far, enhances, the most advanced thinking on environmental protection. It further embodies an unequivocal message that solution to environmental

problems must be sought in the context of development and not outside it. Yet, there lurks a great amount of skepticism over the actual intention of the major actors in the field and the conference was concluded in an inconclusive manner due to disagreements on a number of issues. As Klaus Dodds points out that 'it failed to address some of the most pressing problems such as securing a firm and binding commitment to cutting carbon dioxide emissions, reversing the militarization of environment and exerting firm control on the activities of the multinationals. As with most of the conventions negotiated at Rio, the climate change convention was replete with ambiguities, omissions and qualifications to allegedly binding agreements. The problem of Third World debt and its linkage to poverty and mal-development was not also considered' (Dodds, 2000: 117). The debates that took place over different issues at Rio clearly reveals the prevalence of two kinds of environmentalism; the environmentalism of the rich and the poor, and the post-Rio developments have only made the difference more distinct and pertinent.

Post-Rio Developments

The post-Rio era may be characterised by some major global international debates between the developed and the developing countries, which include the issues like climate change, bio-diversity and also the questions of global funding for environment related activities, although certain progress in carrying forward the Rio-pledges have been made. The 21 December 1993 has been marked as an historic day in the aftermath of Rio as the 50th ratification of the UNFCCC was received at the U.N. headquarter on that day and it allowed the treaty to go into effect in March 1994. But the problems of implementation have become all too clear and the convention-protocol approach was favoured as suitable means to sort those out. The *Kyoto Protocol* is one of the very important examples in this regard, in which 160 nations reached an agreement on limiting emissions of carbon dioxide and other 'green house gases' on December 10, 1997. It commits developed countries to reduce emissions of greenhouse gases; mainly carbon dioxide from fuel combustion in industry; blamed for global warming by trapping heat in the atmosphere, by an average of five per cent of 1990 level by 2012. The long term aim is to curb the artificial warming of the climate and its consequences: rising sea-levels, melting ice-caps, changing rainfall patterns, increased flooding and more frequent droughts.

Although the signing of the protocol signifies a great victory for advocates who have sought to persuade the world leaders to address climate change, the protocol itself has significant gaps and there is still a great deal to settle with respect to the

domestic policy agenda. Hence, clouds deepened over the implementation of it over the years. Even if the *Millennium Summit* of the United Nations, held on 6-8 September 2000 in New York, pledged to "make every effort to ensure the entry into force of the *Kyoto Protocol*" preferably by the tenth anniversary of the UNCED (Millennium Declaration, 2000), the ratification of the proposal became uncertain with the withdrawal of the USA, the world's biggest producer of greenhouse gases from the protocol on March 2001 on the plea that it would hurt the U.S. economy. An optimistic note was, however, sounded at the *Seventh Conference of Parties* (COP-7) to the UNFCCC held in Marrakesh (Morocco) in November 2001, when after a series of negotiations and bargaining, the representatives of 165 states reached an agreement on the modalities of the implementation of the *Kyoto Protocol* (*The Statesman*, 11 November, 2001). However, the basic differences over the crucial issues contained in the protocol between the developed and developing nations continued and it was again reflected in the COP-8 to the UNFCCC held in New Delhi from 23 October to 1 November 2002. Even the original draft of the declaration had to be revised due to the intense pressure of the USA to avoid the mention of the *Kyoto Protocol* (*The Statesman*, 29 & 31 October 2002). It may be mentioned here that the USA, in her attempt to thwart *Kyoto Protocol*, announced a 'growth oriented strategy' to tackle climate change in February 2002 (*The Statesman*, 2 October 2002). Condemning this action of the Bush administration, Remi Parmentier, the Political Director of *Greenpeace International* writes that "the US is doing everything it can to sink the *Kyoto Protocol* and to undermine the Intergovernmental Panel on climate change". He apprehended that "the so-called Bush *alternative plan to Kyoto* would lead to an approximate 30% increase in US greenhouse gas emission" (Parmentier, 2002). In the face of such an adverse situation, however, the COP-8 at New Delhi could make some progress at least in the technological front. It resolved to make the *Clean Development Mechanism* (CDM), as provided under the *Kyoto Protocol*, fully operational without even waiting for the protocol to come in to force. The credit of finalising the procedure of reporting and reviewing emissions data from developed nations also goes to COP-8. It adopted a resolution to make the *Special Climate Change Fund* fully operational before the holding of COP-9 in Italy. Although the conference could not achieve its desired goals in totality, it once again reflected the solidarity of the developing nations, while the developed world have remained unhappy over it (*The Statesman*, 3 November 2002).

Johannesburg Earth Summit and Its Lessons

A ten-day *World Summit on Sustainable Development*, aiming at cleansing the earth of the darkest stains of poverty and averting a potential crash of its eco-

system, held in Johannesburg (South Africa) from 26 August to 4 September 2002. A very symbolic incident of the summit was the children's plea to the world leaders to 'take action' to ensure sustainable development of the planet and to give future generations a chance of happiness. The incident became even more remarkable when the world leaders responded by incorporating it in the main document of the summit. The *Johannesburg Declaration on Sustainable Development* reads: "At the beginning of this summit, the children of the world spoke to us in a simple yet in a clear voice that the future belongs to them, and accordingly challenged all of us to ensure that through our actions they will inherit a world free of the indignity and indecency occasioned by poverty, environmental degradations and patterns of unsustainable development" (*Declaration : 2002*). The summit resolves "to build a humane, equitable and caring global society cognizant of the need for human dignity for all" and in order to achieve this aim, as against the backdrop of U.S. unilateralism, it declares in unequivocal terms: "Multilateralism is the Future". It, however, recorded the "deep fault line that divides human society between the rich and the poor and the ever-increasing gap between the developed and developing worlds" that would "pose a major threat to global prosperity, security and stability" (*Declaration : 2002*). Although Mr. Kofi Annan, the Secretary-General of the United Nations, sounded "an uncomfortable truth" in the summit that mankind's race for growth is so skewed and reckless that without changing course swiftly, it could soon slam into a 'dead end' (*The Statesman*, 3 September 2002), the summit could not make much headway, except making some pious declarations 'to avert a catastrophe capable of engulfing all humanity' due to the opposition of some developed states, particularly the USA. The summit, however, adopted a *Plan of Implementation* featuring thousands of goals and recommendations. Although not a single word among those are of binding nature to the states of the world, the principles and aims it sketches definitely have political weight because they are likely to shape the international agenda on the environment for the next decade or so. The green activists, however, feel dismayed over the developments in Johannesburg as, to them, except a few exceptions, the outcome at the summit was miserably falls short of what was needed 'to avert a catastrophe' (Parmentier, 2002).

Concluding observations

It has been established beyond doubt today that the problem of environmental degradation is a global issue. Mankind is now faced with a wide range of environmental problems that are global in the sense that they affect every states in different degrees manners and those can only be solved only on the basis of the

cooperation among the states. While the management of global environment necessitates high level of cooperation and policy coordination among the states, the nature and character of cooperation as revealed through successive international conferences and summits further established the need for a more closer understanding of the economics and politics of the environmental problems. That is why, one can not miss the essential point that the environmental problems, though apparently scientific and technological in character, are basically socio-economic and political by their implications. If one considers the 'global' initiatives as mentioned above, it reveals that the questions of national power *vis-à-vis* those of the other states and also in relation to different international bodies proved more powerful than the environmental concern of a particular state. Again, the differences in perceptions of the environmental problems by the 'full-stomach' North and the 'empty-belly' South and efforts of the states to shift the blame of the ecological sins to minimise one's own liabilities and commitments have always stood in the way of implementation of the pious declarations of the international community. Although it is often said that the post-cold war era has created a certain political space for environmental issues to assume a greater prominence, the North-South divide prevailed due to the very nature of the issues at stake: population, development, and the responsibility for funding environmentally sound policies. Moreover, when the problems of ecological globalisation are understood in the context of economic globalisation of the present-day world, the problem became much more complex and doubts arise as regards the success of many of the much-publicised initiatives. Finally, as the international concern for environmental problems is basically reflected through different international bodies, particularly the United Nations, the changing nature of those organisations with the changing political reality needs serious attention. International community has been suffering from a number of contradictions in the era of globalisation and the initiatives for protecting and promoting human environment have also been become victim of those. Hence the question arises: Can the United Nations in a divided world made up of nearly two hundred disparate 'sovereign' states achieve the desired level of cooperation and policy coordination required to manage environmental problems on a global scale?

References :

- Birnie, P. (1996) : "The UN and the Environment". in Adam Roberts and Benedict Kingspurly (eds) *United Nations, Divided World*. Clarendon Press, Oxford (Second Edition), p. 327.
- Dodds, K. (2000) : *Geopolitics in a Changing World*. Prentice Hall, London.
- Elliot, L. (1998) : *The Global Politics of the Environment*. Macmillan, London.
- Millennium Declarations (2000) : in *World Affairs*, 4 (4).
-

- The World Commission on Environment and Development (WCED) (1987) : *Our Common Future*. Oxford University Press, Delhi.
- Remi Parmentier (2002) : "Lessons from Johannesburg: What is the Future for UN Summits?" In HYPERLINK "<http://www.greenpeace.org/earthsummit/does/blame2.pdf>"
- "The Johannesburg Declaration on Sustainable Development" (2002): in HYPERLINK "http://www.johannesburgsummit.org/html/documents/summit-does/1009wssd_pop_declaration.htm"
- U.N. Chronicle*, June 1992
- Vogler, J. (1997) : "Environment and Natural Resources", in *Issues in Global Politics*, eds, B. White, L. Richard & M. Smith; Macmillan, London, p. 222.

DYNAMICS AND ENVIRONMENTAL IMPACTS OF CHANNEL PLANFORMS : A STUDY OF BHAGIRATHI AND JALANGI RIVERS

Ashis Sarkar

*Department of Geography
Presidency College, Kolkata 700 073*

Abstract

The independent variables of discharge and load, i.e., the climate and geology of a watershed control the geometry of a river channel. At a reach, the morphology is a result of the interaction of the hydraulics of flow (velocity, discharge, roughness and shear), channel configuration at the reach and immediately upstream (width, depth, shape, slope and pattern), load entering the reach (caliber and amount), and bed and bank material. Mechanism of morphological adjustment includes erosion or deposition in the channel to change its form, slope or pattern and creation and movement of bedforms. Bed scour leads to a lower gradient, increased channel depth and decreased velocity. Bank scour, on the other hand increases channel width and decreases velocity and depth with a given discharge. Deposition on the channel bottom increases the slope and velocity and decreases channel depth. Within the constraints of width changes, actually both depth and velocity are adjusted. The resultant morphology is an expression of balance of river energy and the resistance of material comprising the channel perimeter. The channel form is just that required to carry the load with the available discharge. The channel planforms as recorded in the images at two different dates show that: both Bhagirathi and Jalangi are meandering channels, between the snap dates geometry of the channel plan forms has changed and a beautiful ox-bow lake has formed in the Bhagirathi channel, just a km and half north of the Nabadwip town. The present study emphasizes on the changing morphology of these channels and its environmental impacts.

Introduction

Bengal delta is formed by a chain of fluvio-tectonic actions operating over the neo-miogeosyncline of the Bengal basin. Stratigraphically, a section of the Upper Cretaceous limestone and calcareous shale overlie the Upper Mesozoic basalt flows and associated trap wash, granite wash rocks near Ghatal, Debagram and Jalangi, deposited under brackish, marshy, estuarine, lagoon or partially littoral environments (Bagchi, 1944, Sengupta, 1972). A thick pile of freshwater sediment was deposited near Jalangi between two phases of extensive Eocene marine transgressions that covered the whole of Bengal shelf. During Oligocene, freshwater to estuarine conditions prevailed on the western side while shallow

*Dr. Ashis Sarkar, Professor & Head, Department of Geography, Presidency College, Kolkata 700073,
E-mail : ashis_sarkar2000@yahoo.com*

marine environment existed towards east. During Late Miocene to Pliocene, the sea again transgressed extensive areas and towards southeast. As such sedimentation took place under deltaic and shallow marine environments. During early Pleistocene time, shallow marine conditions prevailed only in the deeper parts of the Bengal basin. Possibly only very late in the Pleistocene, the sea finally receded completely from the Bengal basin area. Erosion then occurred, followed by peneplanation of the whole Tertiary basin area of Bengal. Finally, the older sediments came under the cover of a thick mantle of river-borne Holocene alluvium. (Ascoli, 1910, Bhattasali, 1941).

The lithological matrix is, thus formed by the huge thickness of Quaternary deposits, the upper part of which is truly fluvial in origin (Bose, 1970, 1972). The floodplain provides the requisite arena in which the channel migrates to form the progressively changing planforms, and thereby creates situations where landscape changes lead to considerable environmental impacts. Pedogenesis is primarily based on the parent material of transported alluvium with varying proportions of sand, silt, clay and organic material. Broadly, humid tropical monsoon climate prevails with typical alterations of dry and wet seasons: annual temperature ranges between 14°C - 32°C with highest concentration in summer (March - June), rainfall often exceeds 200 mm in a year and is seasonal occurring mostly between July and September. The fluvial regime of the rivers is characterised by uni-modal hydrograph (Jalangi river) as well as bi-modal hydrograph (Bhagirathi river).

Objectives of the study

The specific objectives of the present study are to:

- identify and classify the channel planforms
- highlight its genesis with the help of a theoretical physical model and
- assess its general environmental impacts

Hypothesis Tested

The set of hypotheses to be tested comprise the following:

- whether the planforms of the channel of the Bhagirathi river shows significant changes?
- whether the planforms of the channel of the Jalangi river shows significant changes?
- whether the genesis of the recently formed ox-bow lake can be statistically modeled?
- whether the changes in channel morphology have any significant environmental impacts?

Methodology of the study

Data has been collected from a variety of sources: planimetric data from topographic sheets and satellite imageries, hydrologic data from the time-to-time on-the-field studies with proper instrumentation and bank profiles from land surveys. Substantial amounts of information has been collected from published as well as unpublished sources like, the records of the River Research Institutes, Calcutta Port Trust, Irrigation & Water Works, Land Records & Settlements, Indian Power & River Valley Projects and a host of other related organizations and libraries. Besides, Census Reports, District Census Handbooks, District Gazetteers, Economic Reviews, Statistical Abstracts, Reports of the District Annual Plan, DRDA Reports and also a number of relevant literatures (*cf.* Banerjee & Chakraborty, 1983; Bergman & Sullivan, 1963; Bernstein, 1983; Chow, 1959; Das & Dasgupta, 1992; Gregory, 1977; Hickin, 1974, 1978; Jensen, 1986; Leopold & Wolman, 1957) were of great help for analysis. To assess the environmental impacts of bank erosion, information was collected through a set of well-planned field questionnaires, a system which were followed during the earlier works of the author (Sarkar, 1984, 1985, 1993, 1995a, 1995b, 1998a, 1998b) from which a systematic compilation, processing and classification derived quantitative data and qualitative information.

The digital image is an array of numbers depicting spatial distribution of a certain field or parameter in terms of DN values, that represents the intensity of the received signal reflected or emitted by a given area of the earth surface. By enhancement, a raw image is improved in terms of visual impact to a better interpretable one for a particular application. It is done using techniques of contrast enhancement (that transforms the raw data using the statistics computed over the whole data set, *e.g.* *linear contrast stretch*, *histogram equalized stretch* and *piece-wise contrast stretch*) and *spatial* enhancement (that only takes local conditions into consideration and results in the modification of an image pixel value, based on the pixel values in its immediate vicinity).

Filters are used to correct and restore images affected by system malfunctioning, enhance the images for visual interpretation and extract features. In high spatial frequency areas, the DN values change abruptly over a relatively small number of pixels (*e.g.* across roads, field boundaries, shorelines etc.) while the smooth image areas are characterized by a low spatial frequency, where DN values only change gradually over a large number of pixels (*e.g.* large homogenous agricultural fields, water bodies etc). Application of a *low pass* filter has the effect of filtering out the high and medium frequencies and the result is an image, which has a smooth appearance. *High pass* filters (*e.g.* *gradient filters* and *Laplacian*

filters) on the other hand, emphasizes high frequencies and suppresses low frequencies, hereby enhancing the edges or boundaries describing steep gradients in DN values in an image.

The spectral information stored in the separate bands is integrated by combining them into a *colour composite*: False Colour Composite (FCC) or Pseudo Natural Colour Composite (PNCC). In FCC the red colour is assigned to the near-infrared band, the green colour to the red visible band and the blue colour to the green visible band. Hence, the green vegetation appears reddish, the water bluish and the (bare) soil in shades of brown and gray. In PNCC, colour output resembles natural colours. Image data is often affected by *geometric distortions* due to *sensor geometry, scanner and platform instabilities, earth rotation, earth curvature*, etc. The correction of 'all distortions' at once is executed by *affine* transformation that combines all the separate corrections. It is given by:

$$X = a_0 + a_1 r_n + a_2 c_n$$

$$Y = b_0 + b_1 r_n + b_2 c_n$$

where r_n = row number, c_n = column and X and Y are map co-ordinates. The transformation is linked with the image so that a reference can be made for each pixel to the given coordinate system and thus, the image is geo-referenced (using *Georeference Corners, Georeference Tiepoints, Georeference Direct Linear, Georeference Orthophoto, and Georeference 3D*). In case the image is to be combined with data in another coordinate system or with another georeference, a transformation has to be applied that results in a 'new' image, where the pixels are stored in a new (row x column) geometry which is related to the other georeference. This new image is created by means of *resampling*, by applying an interpolation method, which computes the radiometric values of the pixels, in the new image based on the DN values in the original image. The final result is a 'new' image, called *geocoded* that can be overlaid with data having the same coordinate system.

While extracting features from satellite images, algebraic operations have been performed on two or more co-registered multiple-band images of the same geographical area. Sophisticated statistical techniques are then conveniently applied to determine the nature of the image properties in a more applicable manner. Image has been classified based on the principle that there is a well-constituted relationship between pixel values and land cover types. The values of the various bands found for 1 pixel are called feature vectors. Such a vector, plotted in a three-dimensional space gives feature space. Pixels belonging to the same (land cover) class and having similar characteristics, end up near to each other in the feature space. For such *supervised thematic mapping*, the most suited

one is selected from the following set : *box classifier, minimum distance to mean classifier, minimum Mohalanobis distance classifier and Gaussian maximum likelihood classifier*. For *unsupervised* ones, all feature vectors in a feature space is first plotted and then analyzed in an unbiased way to group the feature vectors into clusters of desired dimensions, that form and describe the required classes.

Channel Planforms

After taking-off from the Ganga river, the Bhagirathi river with reduced discharge and cross-section flows sluggishly southward throwing off numerous meanders, cut-offs and spill channels. Near Mayapur-Nabadwip, the Jalangi river, a distributary of the parent Padma river joins the Bhagirathi on its left bank. At the head of the interfluvium lies the Mayapur ISKON centre. Approximately a kilometre or so downstream, a road bridge named Chaitanya Setu over the Bhagirathi river has been built in the later part of the 1980s connecting Nabadwip with Krishnanagar as well as with the National Highway connecting north Bengal and north-eastern states of India. The Bhagirathi river appears to be very dynamic in this stretch: progressive meandering with scrolls, scars, abandoned channels and cut-offs can be easily and distinctly identified from the Satellite imageries (Fig. 1, Fig. 2 and Fig. 3). About a kilometre upstream of Nabadwip, closing-in and plugging-up of a meander cut-off present a very interesting geomorphological feature that has evolved quite recently. The planimetric properties of the Bhagirathi river and Jalangi river have been evaluated from the LISS II imageries of 1985 and 1997 (Table 1 and Table 2).

Table 1: Geomorphological / Planimetric Attributes of the Bhagirathi River Channel

Parameters <i>(evaluated from the imagery available)</i>	Bhagirathi river	
	1985	1997
Actual Length (km)	18.65	16.50
Sinuosity Index	1.96	2.12
No. of Cut-offs	5	6
No. of Meanders	8	7
Maximum Width (m)	175 - 200	175 - 200
Minimum Width (m)	50 - 75	50 - 75
Maximum amplitude of a meander (m)	1200 - 1400	1200 - 1400
Maximum Wave Length of a meander (m)	1500 - 1600	1500 - 1600
Minimum Wave Length of a meander (m)	700 - 800	700 - 800

Source : evaluated by the author

Measurements show that between 1985 and 1997, planimetric dimensions of the Bhagirathi river channel changed significantly. Channel length shortened from 18.65 km to 16.50 km, i.e. by 2.15 km or by 11.52%. The index of sinuosity however shows a very small change by only 7.54%. Only one cut-off has been added to the existing number. The steepness of the meander waves ranges between 0.80 - 0.87 and 1.70 - 1.75. In case of the Jalangi river channel, actual length increased from 11.04 km to 12.95 km, i.e. by 1.91 km or by 17.3%. Index of sinuosity increased by 2.4% with the formation of two additional meanders. The steepness of the meander waves ranged between 0.94 - 0.95 and 1.80 - 2.13. Thus, changes have been relatively more rapid for the Bhagirathi rather than the Jalangi channel. The meandering habit of the channels is certainly related to the riffles and pools as meander bends and riffle-pool sequences are repetitive. Meander bends essentially conform to the morphological and hydrological properties and meander geometry is definitely related to the average channel width, radius of curvature and dominant discharge. Pattern of meanders changes over time and in the process bends migrate. In the study area, changes are certainly autogenic and on bends erosion rates are intensified during monsoon when bankfull discharge and flood situation accentuate the process.

Table 2: Geomorphological / Planimetric Attributes of the Jalangi River Channel

Parameters (Evaluated from the imagery available)	Jalangi river	
	1985	1997
Actual Length (km)	11.04	12.95
Sinuosity Index	2.09	2.14
No. of Cut-offs	6	6
No. of Meanders	10	12
Maximum Width (m)	25 - 50	25 - 50
Minimum Width (m)	15 - 25	15 - 25
Maximum amplitude of a meander (m)	1700 - 1800	1700 - 1800
Maximum Wave Length of a meander (m)	1800 - 1900	1800 - 1900
Minimum Wave Length of a meander (m)	800 - 1000	800 - 1000

Source : evaluated by the author

Channel morphology at a reach is a result of the interaction of the flow-hydraulics, channel configuration, load, bed material and bank material. Although some of these are independent inputs, they change by mutual adjustment within the reach to comply with the continuity equations. Adjustment

mechanisms include erosion or deposition in the channel to change its platform, slope or pattern and creation and movement of the bed forms. In an alluvial channel, flow-asymmetry is chance-induced and flow distortion propagates downstream, thereby increasing the head at the outside of a bend. Boundary shear is higher on the inside over the point bar where the sediment bed load discharge is highest. These create a non-uniformity of velocity and pressure distribution in the cross-section resulting in a downward and inward movement of water. This impulse, plus variation in velocity distribution across the channel

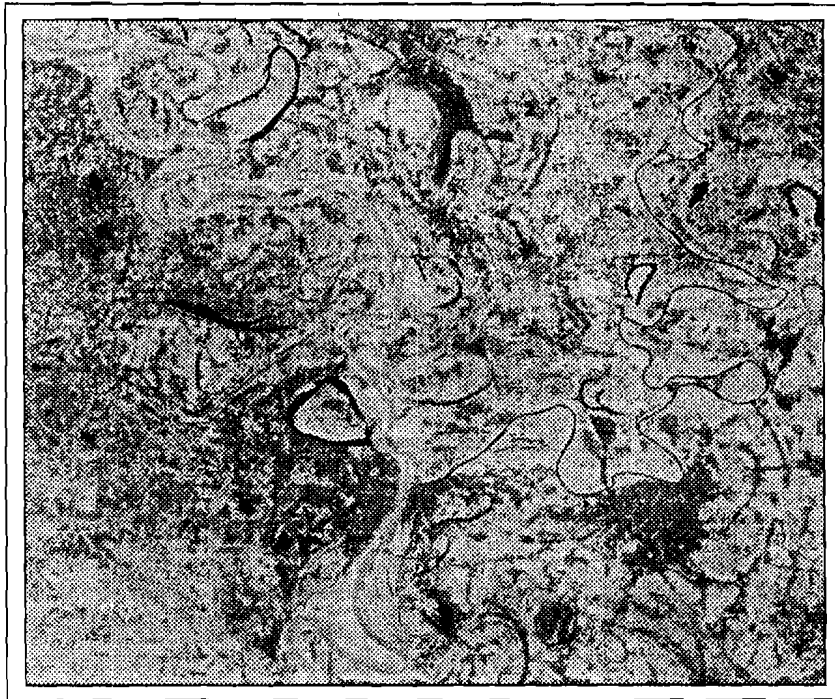


Figure 1 : Planimetric properties of Bhagirathi and Jalangi Rivers in the Bengal basin as depicted in the LISS III imagery taken in 1985

results in transverse secondary currents and increases surface resistance to flow, thereby increasing energy loss at the bend.

In the deltaic landscape with very imperceptible slope constantly adjusts and re-adjusts with the available slope, discharge, length, cross-section geometry and other fluvial and hydrological variables. In the process, such channels present spectacular spectrum of meanders with varying sinuosity and rate of meander

migration. Meander migration may be explained in terms of rotation, expansion, and translation of loop axes (Daniel, 1971). The rate of migration increases with curvature until the curve tightens to a radius of curvature that is twice its width. At this juncture, there occurs disequilibria in flow with sedimentation occurring on the convex bank and erosion at the concave. Width-depth ratio being well below 40, the rivers with dominant suspended and mixed sediments represent single-thread channels with point-bars and some longitudinal, elongate and downstream-migrating channel bars. In case of the Bhagirathi channel, Hickin's

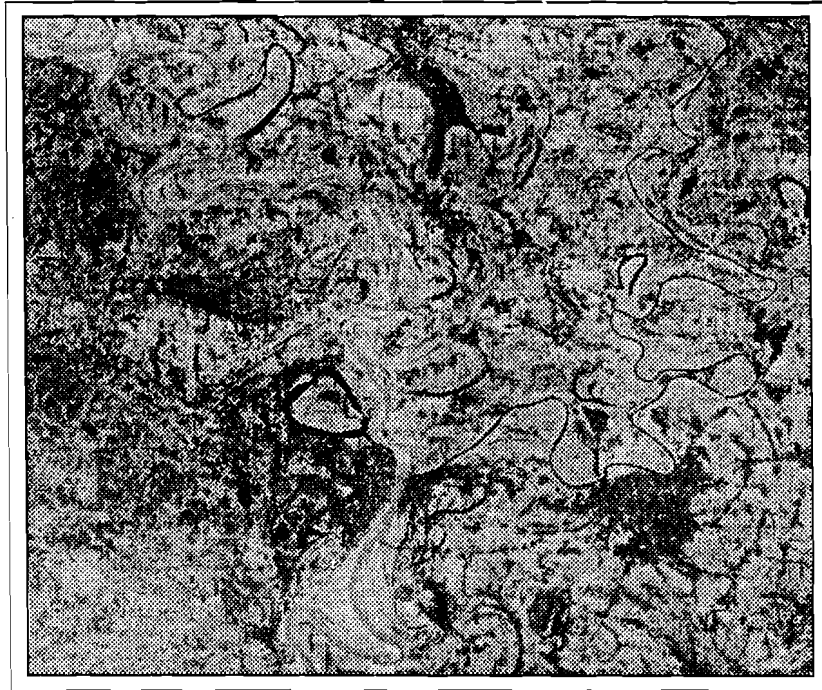


Figure 2 : Planimetric properties of Bhagirathi and Jalangi Rivers in the Bengal basin as depicted in the LISS III imagery taken in 1997

(1978) index of r_m / W has been evaluated to be ranging between 4.10 – 6.00, while that of Jalangi river channel is well above this figure. Hence there is a slight asymmetry of cross-section, a slight skewness of velocity distribution towards the concave bank and a weakly developed secondary circulation.

Environmental impacts

In a deltaic landscape inter-woven by varying dimensions of alluvial channels with varying degrees of sinuosity, meandering along with its migration is a normal

behaviour of fluvial dynamics. In the process, expansion, rotation and translation of the meander loops take place downstream with quite ease within the arena provided by the flood plain of the river channels. Immediate impact of it is bank erosion at selected points and at selected sites. The Bhagirathi river is severely eroding its right bank near Nasratpur Ferryghat near Samudragarh railway station on Bandel-Katwa line. It is progressively consuming vast agricultural land with rural roads and orchards in the Sondalpur area of Balagarh block. The embankment constructed by the PWD with boulder pitching and imported filters has proved without any consequence. Actually new shoals and point bars have been thrown up in the eastern bank towards Ranaghat and as a result, the main flow vector has been shifted westward to induce the existing bank erosion. Since 1998, about 2 - 3 km of land has been eroded by the Bhagirathi river in Guptipara I & II, Charkrisnabati, Somra-I, Sripur-Balagarh, Siza-Kamalpur and



Figure 3 : Planimetric properties of Bhagirathi and Jalangi Rivers in the Bengal basin as reproduced graphically from the LISS III imageries taken in 1985 and 1997

Dumurdaha-I blocks. Formation of chars and islands toward Nadia side is responsible for the lateral erosion in these areas. The worst affected and almost non-existent villages are Hatikanda, Rukeshpur, Gopalpur, Sultanpur, Kapalipara, Milangarh and Sondalpur.

The worst affected mauzas in and around Nabadwip-Mayapur sector are: Maheshganj, Char Majdia, Rudrapara, Bamanpukur, Nabadwip, Gadigachha, Ballal Dighi, Majdia, Brahamanagar, Gangaprasad, Shankarpur, Gadkhali, Teghari, Parmedia, and Char Brahamanagar. Human interference is spectacularly expressed on the downstream side of the Sri Chaitanya Road Bridge connecting Nabadwip with Krishnanagar, where several shoals, point bars and bars have formed during the post-Bridge period. The point bars have become sites of paddy and other vegetable cultivation. In course of time, these will be stabilized making the existing channel narrower and more shallow, enhancing the energy level of the fluvial system. The immediate impact would be severe erosion a kilometer or so downstream, where the flow vectors would naturally be accelerated. Off Mayapur a huge in-channel island has been formed, dividing the transverse flow into two unequal halves and enhancing the intensity of erosion near the meander bend heads. Formation of ox-bow lakes within a period of only 10 - 12 years is geomorphologically very interesting. The immediate impacts are that the fishing community is losing its income opportunities due to dynamic changes in channel system (Table 3).

Table 3: Land and Population affected along the Bhagirathi river

Parameters	1990	1997	2000
Area Affected (in sq. km)	18.20	21.14	23.35
Population Affected (in '000)	1.782	2.224	2.940

Source : Field Survey

Bank erosion produced several impacts: physical, economic, social and political. Physical impacts include changes in channel plan form and its morphology. Economic Impacts mainly concern loss of built-up land or land resources. The degeneration of economic landscape ultimately leads to social crisis and insecurity. Political impacts may be local, national or international. Local leaders and national leaders often play a got-up game in formulating plans, executing projects, distributing relief and rendering rehabilitation schemes, their only object being to provide some immediate relief, keeping intact the entire vote bank. In the study area, physical impacts are pronounced, economic and social impacts are fairly developed while political impacts are still not so important. Urgent attention is required for the mitigation of the erosion hazards.

Synopsis of the findings

Channel planform is very dynamic in generic sense. As planform changes a chain reaction follows in the following manner: changes in channel planform \Rightarrow channel hydraulics \Rightarrow channel flow pattern \Rightarrow meander migration \Rightarrow bank erosion at selected points \Rightarrow environmental impacts. The study focused on the Bhagirathi and the Jalangi river channels in and around their confluence point. Bank erosion by the deltaic alluvial channels is selective both with respect to time and space. The immediate environmental impacts are: loss of existing fertile agricultural lands, crops, settlements, schools, play grounds, green spaces, fishing ponds, pastures, human and animal lives, transport and communication lines, and so on. Thus, bank erosion leads to huge loss of natural as well as human resources leaving behind thousands of environmental refugees with little choice for healthy economic survival and social make-up.

In the study area, settlement and population have multiplied with tremendous intrusion into the playing arena of the channels (i.e., the flood plains), thereby squeezing and pushing them temporarily into thin dying forms. Obviously, where such human interference exceeds the limit of natural tolerance, the serpentine channels are taking vengeance by lateral migration and bank erosion as an output reaction of the fluvial system.

The best choice of man would be to identify, demarcate and delineate the flood-plain boundary from the satellite imageries and leave it to the channels. It should be prohibited for any type of construction and permanent settlements. The geomorphologists and hydrologists would be of great help in this regard to build a sustainable development plan of the flood plains. Till now, however neither the State or the Union Govt. has shown any serious interest. As and when the problem crops up, the poor public, mostly illiterate raise hue and cry on local scale. They are promptly stopped by promises of all kinds of relief on short-term basis. The problem, it is a common experiences, recurs with more severity, causing untold misery to the masses and promises not kept. Peoples' participation in the form of NGO's towards the management issues of this type of natural disaster is still waiting.

References

- Ascoli, F.D (1910) : Rivers of the Delta, *Journal & Proceedings of the Asiatic Society of Bengal*, Calcutta, Vol. 6, 543 - 556.
- Banerjee, S.N and Chakraborty, P (1983) : Some Observations on Recent Trends of Shifting Pattern of the Ganga between Rajmahal and Ahirom, *Journal of the Geological Society of India*, 24 : 318 - 321.
- Bergman, D.L and Sullivan, C.W (1963) : Channel changes on Sandstone Creek near Cheyenne,

- Okhlahoma, USGS Prof. Paper No. 475-C, C145 - C148
- Bagchi, K (1944) : *The Ganges Delta*. Calcutta University Publication, 8 - 89.
- Bernstein, R. et al. (1983) : Image Geometry and Rectification. Chapter 21 in *Manual of Remote Sensing*, edited by Robert N. Colwell. Falls Church, Virginia: American Society of Photogrammetry.
- Bhattachali, N.K (1941) : Antiquity of the Lower Ganges and its courses. *Science & Culture*, Nov, 233 - 239.
- Bose, N.K. (1970) : Rivers of West Bengal and their Control, in A.B. Chatterjee, et a (ed) : *West Bengal*, Firma K L M. Calcutta.
- Bose, N.K. (1972) : The Bhagirathi - Hooghly - a few remarks, in K. Bagchi (ed) : *The Bhagirathi - Hooghly Basin*, Calcutta University Publication.
- Chow, Ven Te (1959) : *Open Channel Hydraulics*. McGraw-Hill, 680pp.
- Daniel, J F (1971) : Channel Movement of Meandering Indiana Streams - physiographic and hydraulic Studies of rivers. *USGS Prof. Paper*, 732 - A.
- Das, S.C and Dasgupta, R.K (1992) : Study on combating threat to Land Resources from Erosion and Bank Failures of the Rivers Bhagirathi-Hooghly and Ganga in West Bengal, *Eastern Regional Centre for Wasteland Development, Jadavpur University, Calcutta. Report 22 : 10 - 17*
- Gregory, K.J (ed. 1977) : *River Channel Changes*, John Wiley & Sons, p145-164.
- Hickin, E.J. (1974) : The Development of Meanders in Natural Channels, *Amer. Jour. Sci.*, 274, 414-442.
- Hickin, E.J. (1978) : Mean Flow Structures in Meanders of the Squanish River, British Columbia, *Cand. Jour. Earth Sci.*, 15 (11), 1833 - 49.
- Jensen, J. R.: (1986): *Introductory Digital Image Processing- A Remote Sensing Perspective*, Prentice-Hall, Englewood cliffs, New Jersey.
- Leopold, L.B and Wolman, M.G (1957) : *River Channel Patterns - braided, meandering and straight*, USGS Prof. Paper, 282-B
- Sarkar, A (1984) : Some Considerations in Theoretical Fluviology, *Geog. Rev. Ind.*, 46 (2), pp 82-85.
- Sarkar, A (1985) : Some Deductions in Theoretical Fluviology, in Sen, P (ed): *Concepts and Methods in Geography*, Institute of Geography, Burdwan University, pp 150-154.
- Sarkar, A (1993) : Environmental Impact Assessment - a case study of bank erosion by Rupnarayan river, *Proceed. Inter. Sem. on Environmental Hazards and their Mitigations, I.G.I., Calcutta*
- Sarkar, A (1995a) : Pattern Continuum, Bank Erosion and Channel Metamorphosis of the Rupnarayan R. Channel. West Bengal. Paper presented in the *16th Indian Geographical Congress*, NAGI, Hyderabad.
- Sarkar, A (1995b) : The Rupnarayan R. - a study in channel patterns, *Indian Journal of Power and River Valley Projects*, July - August Issue, pp100-105.
- Sarkar, A (1998a) : Bank Erosion by Rupnarayan River - a study of geomorphological hazard, paper presented in the International Seminar on Changing *Environmental Scenario in South Asia during the past Five Decades*, Dec 20 - 21, ILEE, Abstract Volume, Paper No - 13. (with S. Nayak).
- Sarkar, A (1998b) : Downstream Effects of Dams / Barrages on Channel Morphology - a study in environmental fluviology, in S.N. Chauhan and M.K.Gupta (ed) : *Environment - some basic issues*, Jaishree Prakashani, Muzafarnagar, UP.
- Sengupta, S (1972) : Geological Framework of the Bhagirathi-Hooghly Basin, *Proceedings of the*

STATUS OF WOMEN IN THE COAL MINING COMMUNITIES OF THE RANIGANJ REGION IN WEST BENGAL

Kuntala Lahiri-Dutt

Department of Geography
University of Burdwan, Burdwan 713 104

&

Ira Ghosh

Department of Geography
Salbani College, Bankura

Abstract

The changing mode of resource generation in the Raniganj coalbelt has redefined the role and status of women among the coal mining communities in this region of Burdwan district, West Bengal. This has been studied, through quantitative indicators, the variations over space of the approximate nature of such social phenomena as status and role in gender context. This paper has used 1991 census data to arrive at simple indicators like FMR values of different sub-groups of the population, their literacy levels, survival capacity and work participation ratios to bring out the intra-regional variations in the status of women. This status is dependent on the economic role of women in society. The mining sector of the present times has slowly excluded women who formed such an important component of the workforce in the past. By stripping them of their right of participation and productive role, the modern mining sector has pushed women into a position of lower status within the society.

Introduction

We begin with two sociological concepts that have much bearing with resource management, especially mining and local communities. The terms 'status' and 'role' are apparently unrelated, but actually they are interdependent especially in resource production and management processes. For example, 'status' simply denotes 'the relative position of persons in a social system or sub-system which is distinguishable from that of others in its rights and obligations' (ICSSR; 1975, p. 3). This status is usually expressed in terms of a 'role', and this is true especially of women than men. The status an individual occupies within a society depends upon the role she performs within it - at home and outside of it - and the appraisal of that role by the larger society which is based on patriarchal values (ICSSR,

Dr. Kuntala Lahiri-Dutt, Reader, Dept. of Geography, University of Burdwan, Burdwan 713104
E-mail: klahiri_dutt@hotmail.com.

Ms. Ira Ghosh, Lecturer, Department of Geography, Salbani College, Bankura

1975). Clearly, the more economic value a role has, the higher the status it will associate with.

Status is usually thought to have a financial aspect derived from income levels; this indicates more of an economic standing than an economic role. However, recent research in gender has more than clearly established status for women has more of a cultural connotation than an economic qualification (Gibson-Graham, 2000). In India too, feminist scholars such as Banerjee (1992) have stressed the importance of looking at status emanating from cultural norms of the patriarchal families within which women are usually placed.

Two most influencing factors for the status of women in India or elsewhere are employment and education (Mitra, 1979). While employment determines the level of food availability, nutrition and the level of satisfaction of other essential needs, education determines the individual's aspirations, level of technology used, productivity and vertical and horizontal mobility of the women workers.

However, 'employment' itself is usually defined in a very restricted sense by the modern industrial society, and considers only the economic roles played by individuals. Again, economic role is defined in a very restricted sense to mean that work which is conducted in exchange for money. This economic role of individuals in society has been most influential in defining their status. This, however, leads to an underestimation of women's work, by not considering its intrinsic use value or human value (Jain, 1996a), but only its value for exchange. Thus their economic role is insufficient un-rewarded and undervalued. Even the census of India does not properly enumerate women's role in the economy as it categorizes most of the women as non-workers (Mazumdar, 1975), their contribution being 'unpaid' and 'non-market' and hence not 'economic' activities.

In traditional societies where the family is the predominant unit of production, women play a more direct role in the economy. In these societies, the family functions as a production unit where the contributions of all its members are important. The transition from the traditional to industrial mode of production breaks up the family unit into individual competing units. In this system women usually get left behind because of their lack of opportunities to develop new skills in the new system of production (Mitra, 1979; Shiva, 1991)

Objectives of the Study

The purpose of this study is to focus on the role and status of women in the Raniganj coalbelt of Burdwan district. We have discussed 'women' with all the implied heterogeneity within the category to mean all the castes, classes, and ethnic groups in a rather broad sense as implied by the census data. The objective

of the research, which this paper reports is to draw a relation between role and status of women using census data, combined with field observations. The status of women is dependent on the type of economy and the mode of production in which they are involved. Two hundred years of mining in the Raniganj coalbelt has not only brought about a change in its economy and environment, but has also led to a social transformation, which redefined the women's role in the home and outside of it. This redefinition has meant exclusion of women from the formal sectors of the economy, including large-scale coal mining. The overwhelming male dominance in the coal industry especially since nationalization and the adoption of labour safety laws (those about women's work in underground and at night) has restricted women's involvement in the hazardous mining sector. They have slowly become extremely marginalized to the formal economy of the region. The other development sectors within the Raniganj coalbelt apart from coal mining, that is, a male labour force also dominates heavy industries, transport and commercial activities. Women's employment opportunities are now highly limited in these better paying, more secure, modern, capital-intensive sectors, whereas poorer women find jobs in the informal sector. This is manifest in the low literacy, work participation ratios and FMR of the female population with respect to its male counterpart.

Methodology

Police station level data of various characteristics of the female population of the 1991 census has been used to see the variations in different characteristics of the female population of the region. Some indicators which reveal multiple characteristics of the female population, that is, females per thousand male ratios (FMRs), literacy, survival capacity, work participation ratios have been used to assess the present role and status of women in this old mining region of India. Mining has had a differential impact over the region. The southern part of the region, traversed by the two main railway and road arteries, the Eastern Railways and the G.T. Road, and the early mining centre, industrial hub and urbanized part of the coalfield is comprised by the Kulti, Hirapur, Asansol (North and South), Raniganj and Ondal police stations, where agriculture has lost much of its significance as an important economic activity (Lahiri-Dutt, 2001). Barabani, Jamuria and Pandaveswar are also colliery areas but with a much lesser degree of industrial development and urbanization, where agriculture is still an important occupation for most people. So we expect the police station level data to be able to broadly generate a picture of the relation between the general economic pattern and the roles played by the women in these various economies

- agricultural, mining, industrial and commercial - which assign them their place or status in the economy and society.

Gender in the Raniganj Coalbelt

Women perform a diversity of roles in the economy and society. Therefore, the ratio of numbers of women and men is an approximate indicator of the socio-economic conditions prevailing in an area and is a useful tool for any regional analysis (Franklin, 1956; Chandna and Sidhu, 1979). Female-Male Ratio (FMR), previously called sex ratio in a rather gender insensitive manner, is a good figure to use in such cases.

A study of the FMR in the Raniganj coalbelt reveals an average ratio of 839 females per thousand males (Table 1). The figure is much below the national average (929), state average (917) and district average (899). This skewed gender distribution in favour of males suggests there could be *three* features associated with coal mining in the region:

1. male labour immigration in search of job opportunities;
2. gender bias in the coal mining industry; and
3. less economic and social opportunities and consequent displacement of females.

Table 1 : Gender Ratios in Total Population, Raniganj Coalbelt

Police Stations	Total Population		FMR
	Male	Female	
Salanpur	50,742	44,669	880
Kulti	1,35,829	1,14,451	843
Hirapur	95,164	79,769	838
Asansol (North)	1,74,296	1,45,526	835
Asansol (South)	2,497	2,151	861
Barabani	44,762	40,754	910
Jamuraia	1,12,655	93,712	932
Raniganj	1,05,213	84,597	804
Pandaveswar	51,849	40,752	786
Ondal	1,13,968	90,809	797
Faridpur	42,999	36,435	847

Source : District Census Handbook, Burdwan, 1991

A disaggregated spatial analysis of the female per thousand male ratios (FMRs) among the three distinct categories - the *adivasis* (the scheduled tribes),

the scheduled castes and others (which is normally referred to as the 'general' category) - within the Raniganj coalbelt has been done as these three groups differ from each other in terms of socio-economic conditions (Table 2).

Table 2 : Disaggregated Gender Ratios for Population Sub-Groups, Raniganj Coalbelt

Police Stations	FMR			Level of Urbanization
	S.C.	S.T.	Others	
Salanpur	906	1009	847	9
Kulti	878	959	823	100
Hirapur	874	981	822	100
Asansol (North)	866	956	827	87
Asansol (South)	856	968	804	0
Barabani	908	1026	884	13
Jamuraia	873	913	804	54
Raniganj	852	939	776	79
Pandabeswar	832	885	755	40
Ondal	837	863	775	82
Faridpur	871	943	825	21

Source : District Census Handbook, Burdwan, 1991

The *adivasis* (aboriginal people of the area), composed largely of inhabitants, were described in colonial records as the original stock of the region thriving on a subsistence forestry-agriculture economy (Paterson, 1910). Such economies have been noted elsewhere to be characterized by a high female labour participation, primitive cultivation techniques and low level of magnetization (Boserup, 1976; Agnihotri, 1995). Very little is known about that economy which existed before the advent of mining. The Raniganj region was described by many colonial records to be a densely forested area with very few settlements and a low population density till mid 1800s (Hunter, 1877; Government of Bengal, 1939). Whereas the majority of the inhabitants belonged to *adivasi* groups at that time, a completely different picture emerges today as these communities have become significantly marginalized to the mainstream population. The FMR of the tribal population is more stable where the status variation between the sexes is also low. Within the *adivasi* population, in Barabani, the ratio is highest with 1026 females per thousand males, and in Ondal (863), one of the highly urbanized police stations, it is worst.

The scheduled castes comprising mainly of Bauris, on the other hand, were the major suppliers of casual labour both in agricultural and non-agricultural

sectors. They have been described as the 'unprotected' class (Miller, 1981). When mining started in the region, they were among the first to join the labour force. The Bauris were also the first to bring their women and children into the mining industry. There was a large peasant labour migration in the early years of the industry from the adjoining districts who settled in the region in plots of land given to them to ensure their permanent supply to the mines. Amid the scheduled castes population, Barabani (908) and Salanpur (906) have the highest FMR, and Pandaveswar (832) and Ondal (837) have the lowest.

Points to note are that Ondal and Pandaveswar Police Stations are also associated with a high intensity of mining activities. Again, Ondal is one of the areas where widespread urbanization has occurred in the last two decades giving rise to urban centres of various sizes. The 1991 census has described Ondal as a sizeable urban agglomeration. In addition to the Raniganj township located nearby and the smaller census towns, there are several urban outgrowths in these police stations. Most of these urban centres have had their beginnings in recent years as small colliery settlements of Kenda and Kajora areas of the Eastern Coalfields Limited. Police Stations Salanpur and Barabani, on the other hand, have fewer and smaller urban centres (Lahiri-Dutt, 2001). The contrasting nature of the economic bases of these two areas is clearly related to their variations in gender distribution of scheduled caste populations.

With the development of coal-based industries and mechanization of the mining industry, especially in the last three decades, the region has experienced a large-scale immigration of males of 'upper' or general caste population. As labourers in the formal sector, they are the more privileged class, enjoying a higher position both in the economic and social ladder. As a result they get the opportunity to acquire and develop special skills for well-paid jobs both in the formal and informal sectors. However, representation of women among this community of skilled workers is low which probably accounts for the group having the lowest FMRs in the region. Within it again Barabani (884) and Salanpur (847) have the highest FMR and Pandaveswar (755) and Ondal (775) have the lowest. The variations indicate the intra-regional pattern of general/other caste male immigration into the colliery areas.

Analysis of the data on subgroups of the population revealed that the FMR of scheduled tribes population is comparatively much better (949) than in the other two groups. The mean FMR of scheduled castes population in the region is 868, which is again above the region's average of 839. The rest of the population (general castes) has a very poor FMR (813), which is much below the average. This clearly reveals that there has been selective immigration of males - but mostly

from the 'general' castes, not the scheduled castes and tribes. This is also probably reflective of the gender bias in the job opportunities offered by the coal-based heavy industries, and formal sector of trade and commerce of the region.

Literacy among Women

The literacy rate among the women is low throughout the region. Although the region has experienced rapid urban-industrial development due to its coal resources, which had led to the establishment of many industries thereby contributing to the prosperity of the nation, the women population have not made much progress so far as literacy is concerned.

The overall literacy (both man and women) of the region is 50.66 per cent. Among males it is slightly higher, 60.26 per cent, whereas among women literatures constitute only 39.23 per cent of total female population (Table 3).

Table 3 : Literacy Status, Raniganj Coalbelt

Police Stations	Percentage		
	Female Literates to		Male Literates to Total Males
	Total Females	Total Literatures	
Salanpur	41.25	36.21	63.98
Kulti	40.24	35.98	60.33
Hirapur	50.38	38.30	68.04
Asansol (North)	55.57	40.37	68.53
Asansol (South)	37.33	33.82	62.92
Barabani	29.62	32.77	55.33
Jamuraia	30.51	32.43	52.88
Raniganj	40.18	34.88	60.18
Pandabeswar	31.12	31.50	53.18
Onda	140.00	34.64	60.15
Faridpur	35.49	34.40	57.34

Source : District Census Handbook, Burdwan, 1991

Survival Capacity of Females

Previous demographic studies in India (ICSSR, 1975) have shown that there is a distinct differential in life expectancy between the sexes. Moreover, this gap in the life expectancy between the sexes has been increasing in recent decades (IIPS, 1995). In the coalbelt too, we get a dreary picture of the survival capacity of females as compared to males.

In this study we made use of the females per thousand male ratios (FMRs) for the population both below and above six years of age. A decrease in the ratio

means a higher female infant mortality for the population. While demographers have searched for various reasons to explain this phenomenon, it is generally accepted that improvements in health services in the last few decades have had a differential impact on the health condition of the sexes, leading to persistent decline in FMR.

Although the factors that cause this adverse FMR and the high mortality of female infants may be attributed to a whole lot of socio-economic and cultural factors, which require a deeper study, the mere presence of a decreasing FMR for women indicates the lower status for them in the society.

In the Raniganj coalbelt the two FMRs for population below and above six years of age show that in all the police stations proportion of females are lower for the above six years age group. This is indicative of higher female mortality in the above six age group, and also male selective migration in the higher age groups. However, the decrease in FMR is not the same for all police stations. In Barabani, an agricultural pocket, this variation is the least. Whereas in colliery-dominated areas like Asansol (South), Pandaveswar and Ondal, the variation is particularly high. The average variation for the whole region is 158 (Table 4).

Table 4 : Survival Capacity of Females, Raniganj Coalbelt

Police Station	Females		Difference
	Below 6 years	Above 6 years	
Salanpur	990	860	130
Kulti	946	823	123
Hirapur	959	818	141
Asansol (North)	939	818	121
Asansol (South)	1110	820	290
Barabani	970	897	73
Jamuraia	951	809	142
Raniganj	966	776	190
Pandaveswar	969	753	216
Ondal	974	770	204
Faridpur	942	829	113

Source : District Census Handbook, Burdwan, 1991

Work Participation Ratio

The role and contribution of women in domestic labour often gets overlooked or taken for granted. It is the amount of direct contribution in the formal economy, which allocates values to a woman as an individual and marks her status in society.

The poorer women of village communities are the most affected in the newly

industrializing regions by the modern development in the formal sector. The new avenues of employment that emerge with such developments close the old economic forms into which women used to get jobs. At the same time, the new economy fails to open up any avenues of income for women. On the other hand, especially in urban areas, social changes such as the spread of education, increasing costs of living and social change, particularly the disintegration of the joint family and breakdown of traditional patriarchal beliefs have taken place. The new mindset has helped some women of the better off classes to enter new professions, particularly in the tertiary sector, which were inaccessible to them earlier. However, this group is small in proportion to those women of poorer communities who were displaced from their traditional livelihood sources. Not only did the mining economy explicitly reject women, it also eroded their sustenance bases and scope of employment in other sectors by disrupting the agricultural activity and destroying the environmental resources.

This differential impact of mining development on women makes the analysis in purely quantitative terms inadequate in bringing out the true picture. National as well as state statistics in this regard are of not much help as the process of averaging the data leaves out the unique aspects of particular groups, particular regions such as the Raniganj coalbelt and the specific problems they have. Besides, women are certainly not a homogeneous group. Any analysis of women's roles, therefore, has to be made with regard to the various segments differentiated by socio-economic characteristics (including caste and religion as well as economic class) and their degree of adjustment with the new economic forms and modes of production or resource extraction.

Table 5: Women's Work Participation, Raniganj Coal belt

Police Station	Percentage of Women Workers in			
	Total Female Population	Total Work Force	Selective Low Pay Occupations	Selective High Pay Occupation
Salanpur	7	14	16	8
Kulti	3	6	5	4
Hirapur	4	7	2	3
Asansol (North)	4	7	3	3
Asansol (South)	3	8	6	6
Barabani	12	23	37	10
Jamuria	5	9	2	3
Raniganj	4	7	7	5
Pandabeswar	4	7	2	14
Ondal	3	5	11	3
Faridpur	4	7	15	3

Source: District Census Handbook, Burdwan, 1991

In this region where the traditional village-based activities have given way to mechanized mining, and rural lifestyles have given way to urban, women have become more and more marginalized to mainstream economy. The mining, iron and steel and other allied industries of the region have in recent years have largely depended on male labour. Women, due to lack of the required skills, have found themselves unwanted in most of the new jobs created in the formal sector of this rapidly industrializing region. Among the upper or general castes population, traditional social values too, have until recently restricted them from seeking jobs outside home.

The percentage of female workers to total female population is 4.82 per cent, and to total working population is 9.09 per cent for the region. Again if we categorize some of the occupations into high paying (that is, mining and household and other than household industries) and low paying (that is, agricultural labourers, cultivators, and livestock, fishing and forestry etc. and allied activities), we find that whereas only 4.91 per cent of jobs in the high paying sector belong to women, as much as 13.27 per cent of workers in the low-paying jobs are for women. In the rest of the occupations in the census categories (that is, construction, trade and commerce, transport, storage and communication, and other services), only 6.73 per cent of workers are women.

We found female labour to be concentrated either in the 'low pay' unorganized sector or as 'unpaid' family labour. In either case their contribution to the household and to the economy remains unrecognized, and they remain the victims of exclusion from resource management processes.

In the Raniganj coalbelt fuel and water collection are two important activities engaging a large number of women. The easily available fuel, either scavenged from the abandoned quarries or from illegal mines serves as home fuel and is also easily sold in the black market. The entire Raniganj region being the centre of coal mining activities in the state of West Bengal, does not have even one coal depot throughout it. The residents of the region are used to purchasing coal supplies from the illegally quarried coal from the surrounding collieries, abandoned mines and pockets scavenged upon and brought by locals in baskets and sold from door to door. Women of poorer families along with their children play a major part in the collection and retail sales of this coal.

The various environmental problems of the region most directly affect the women and increase their workload. For example, when a part of the land subsides, it lowers the water table of the surrounding area too. Here the continually falling water table in many areas, a result of mining, have led many women particularly in the north-western and eastern parts of the region to travel

long distances for water during most parts of their day.

Women Workers in the Mining Industry

During its early years of development, women of the Raniganj coalbelt played a more important role in the mining workforce. When mining first started in this region in 1774, under British entrepreneurs, and even during the era of private operations in the present century, mining was mostly a family enterprise. The Bauris were the first to bring their women into the collieries, and the role played by their women was quite significant (Banerjee, 1940). The Santhal, Kol, Kora or Bhuiya men also jointed the mining industry with the women members of their family. According to the *Annual Reports* of the Chief Inspector of Mines, between 1901-'21 women workers comprised above 35 per cent of the work force in the Raniganj coalbelt. In other coal producing areas, excepting Jharia, women's participation in mining was never very significant.

In the early part of the present century women mine workers emerged mainly as loaders of coal cut by their respective male partners. A typical family system of operation was prevalent in the Raniganj coalbelt until the ban on the underground employment of women between 1929 and 1938. The Bauris and Santhals readily shared the work with women of their own caste. Women usually worked as loaders while their male partners - father, brother, husband - did the heavier job of cutting the coal (Roy Chaudhury, 1996).

The system operated well for several reasons - the tribal sentiments of family attachment, unwillingness of women to carry coal cut by the men of another caste, and above all, for yielding large economic benefits for the owners and uninterrupted maintenance of work-rhythm.

The advent of machines during 1930s in coal production in India resulted in a shift in the employment opportunities of women mine workers. As deep shafts replaced the open cast mines, women were considered unfit for underground jobs. The technological shift produced in its wake a ban on women labour for underground employment of women in Bengal and Bihar coal mines as a temporary measure (Deshpande, 1946).

Since independence, the numbers of women mineworkers has gradually been falling in the Raniganj coalbelt, as in all other parts of the country. This was partly the effect of the National Industrial Labour Laws of 1954 restricting women's work in mines. In the current phase of modernization heavy pay-loaders and earth-movers operated by men work the opencast mines whereas computerized heavy machinery raze out entire coal seams from underneath the ground. Once again, women workers are being considered as dispensable, and the development

process in bypassing those who have contributed so much to the growth of the mining industry of India.

After Nationalization in 1972-'73, the mining industry under the Eastern Coalfields Limited became the largest employer of the region. In the year of the last census (1991), the company had a total of 1,77,889 workers (including small areas outside Burdwan District) on its payroll. Among them only 12,804 (7.20 per cent) were women. At present (2001) the West Bengal part of the ECL employs 1,39,726 workers, of whom 7,949 (5.69 per cent) are women.

Women are now excluded from the formal mining sector in all senses. This is because of laws banning women from working underground and at night. Thus women can only be employed for the surface-level work as loaders or on office duties during the day. The Baveja Committee report of 1979 on the *Economics of Coal Production* recommended the reduction of the women work force. The prevalent male-dominated societal attitude is reflected on the opinions of the senior officials of the ECL. Most colliery managers consider women workers as a 'burden' than a potential workforce. Even some trade union leaders feel that women are 'better off' as long as they are not involved in the 'dirty' mining work. Thus, the prevalent perceptions of women as a potential workforce discouraged their effective involvement in coal mining.

The number of women employees in the mining sector in the whole country experienced the most rapid decline between 1951 to 1971. The situation was worst for the coal-mining sector. The rapid reduction in the number of female workers has come about as a result of a number of factors like the policy of equalizing wages and structural changes in the economy.

After the nationalization of the coal mines, direct recruitment of women has become a very rare incident. Some women have been employed as nurses and teachers in ECL-run hospitals and schools. Most of the women employees in the Company were recruited on *two* grounds: (a) either due to death of their spouse or some other male family member, on compassionate ground; or (b) as compensation for land ousters. Here too, the official policy has been to favour male family members, and only when they are not available is the offer made to the female.

Despite the fact women employees in the organized or public sector mining industry are already low in number, their proportion to the total workforce has been gradually declining over the last fifteen years.

This is because of two factors: The 'Golden Handshake' or Voluntary Retirement Scheme (VRS). This was earlier extended to all employees but now are specially aimed at female workers; and b) Exchange of the post by the women

worker to a male member of her family.

Lately, the mining industry's unwritten policy has also been to discourage the woman next to kin to take up employment even on compassionate grounds, and to persuade her to take monetary compensation instead.

Women in the Informal Sector

Although the participation of women is rare in the workforce of the organized sector, we found a large number of women working in the unorganized or informal sector about which no reliable statistics are available. The main activities in which the women are engaged are:

1. As informal miners in the rat-holes, and as coal scavengers from the abandoned mines and quarries, and remote pockets of the coal region. Most of them live in abandoned *dhaoras* and villages scattered around the collieries. A large number of children and alcohol-addicted or dead spouses often force them into this work. A bag of coal gathered in a day fetches around Rs. 25-30/- enabling entire families to subsist and survive.
2. As housemaids and servants in the large number of newly developed urban centres and colliery townships.
3. As scavengers, picking out of plastics, rags and paper bags from wastes around the collieries and towns. All over the region, the thriving urban and semi-urban settlements have begun to generate considerable amounts of waste in these forms. Most of the ragpickers are women and children, surviving on other people, often toxic, waste materials.
4. As construction labour in road and building construction sites;
5. As agricultural labour;
6. As the itinerant labour of *thekedars* (contractors), working on any available work - in stone cutting or crushing units, brick-making kilns, lime factories, etc.; and
7. Finally, women find work as unpaid family labour all over. In the region, the poor peasant women in charge of running the household, always have to take the responsibility of collection *three* basic requirements: fuel for cooking, water for drinking and other household needs, and fodder for livestock. These family-needs may be described as subsistence needs and are always taken care of by women. Environmental resources in poor peasant communities usually provide these subsistence needs. The degraded forest cover, government ownership of land and water-tanks, and a falling groundwater table have made the last two basic needs extremely hard to fulfil.

Limited skills, illiteracy, lack of employment opportunities, and the lack of control over productive resources give these women a poor bargaining power. They are often haplessly exploited within home and beyond it as well. The male members of mining families, by virtue of being the cash-earners, often ill-treat the women. Incidents of domestic violence and drunkenness are more the rule than the exceptions in colliery settlements. Women have been rendered powerless by their exclusion from the productive process; they have no real decision-making power in social, economic or political matters.

Conclusion

On an overview one can see that the presence of coal mining industry has distorted the gender distribution within local communities in the Raniganj coalbelt. This is evident from the poor FMRs in all the Police Stations comprising the region.

It is also revealed from our study that the work participation rates of women are very low in general, and in an occupation-selective manner in particular. That is, working women of rural communities, if present at all, almost invariably find employment in the low-paying jobs.

The marginalization of women from the dominant or mainstream economy has lowered their status in a significant manner. As a result of this exclusion of women, the mining-urban-industrial economy of the region has become overwhelmingly male. The modern economic forms based on resource extraction in the region have entirely benefited the communities in a gender-specific manner.

Since there is an increasing awareness in the mining industry about safety and environmental concerns, the issue of gender once again becomes relevant. At present there is an oncoming wave of mechanization and tendency towards opencast mining for improved productivity. This should provide more scope for women's employment in the mining industry.

There should also be a greater recognition of women's role in the home as the unpaid labour in the family, and their work in the unorganized sector. In the villages too their roles in the society have been losing significance due to the onslaught of modern mining development which has broken down traditional social ties, degraded the environment and has rapidly changed gender equations in the formal production process. With declining agricultural opportunities, loss of forests and commons, and invasion of the collieries where they have no place, the women of the region have been forced to a marginal entity in the Raniganj coalbelt.

References

- Agnihotri, S.B. (1995) : Missing Females: A Desegregated Analysis. *Economic and Political Weekly*, Vol. XXX, No. 33, August 19, 1995; pp. 2074-84.
- Bannerjee, N. (1992) : *Poverty, Work and Gender in Urban India*. Centre For Studies in Social Sciences, Calcutta.
- Banerjee, P.K. (1940) : Settlement Report of Asansol Subdivision of the Burdwan District (1918 - 1921). in K.A.L. Hill's *Final Report of the Survey and Settlement Operations in the District of Burdwan (1927 - 1934)*; B.G. Press, Calcutta.
- Baveja, G.C. (1979) : *Spotlight on Coal: Report of the Committee on Economics in the Production of Coal*. Government of India; India Book Exchange, Calcutta, pp. 4-7.
- Eoserup, E. (1970) : *Women's Role in Economic Development*. Allen and Unwin, London.
- Chandna, R.C. and M.S. Sidhu (1979) : Sex Ratio and its Determinants, in *Transactions of Institute of Indian Geographers*, Vol. 1, No. 1, July 1979, pp. 17-23.
- Deshpande, S.R. (1946) : *Report of an Enquiry into Conditions of Labour in the Coal Mining Industry in India*. Delhi.
- Franklin, S.H. (1956) : 'The Pattern of Sex Ratio in New Zealand' cited by R.C. Chandna and M.S. Sidhu (1976). in *Transactions of the Institute of Indian Geographers*, Vol. 1, July 1976.
- Gibson-Graham, J. K. (ed) (2000) : *Class and its Others*. Basil Blackwell.
- Hunter, W.W. (1877, reprinted in 1973) : *A Statistical Account of Bengal*, Vol. IV *District of Burdwan, Bankura and Birbhum*, Trubner & Co., London, Reprint by D.K. Publishing House, Delhi.
- ICSSR (1975) : *Status of Women in India : Synopsis of the Report of the National Committee*. Allied Publishers, New Delhi.
- IIPS (1995) : *National Family Health Survey 1992-93. India: Summary Report*, International Institute for Population Sciences, Bombay.
- Jain, Devaki (1996) : Valuing Work : Time as a Measure. In *Economic and Political Weekly*, October 26, RWS, pp. Ws 46-57.
- Krishnaraj, M. and Karuna, C. (1989) : *Gender and the Household Domain : Social and Cultural Dimensions*. Sage, New Delhi.
- Lahiri-Dutt, K. (2001) : *Mining and Urbanization in the Raniganj Coalbelt*. The World Press, Calcutta.
- Miller, B.D. (1981) : *The Endogenous Sex*, Cornell University Press, Ithaca, N.Y.
- Mitra, A. et al., (1979) : *The Status of Women: Household and Non-household Economic Activity*. Allied Publishers, New Delhi.
- Mitra, A. (1979) : *The Status of Women: Literacy and Employment*. Allied Publishers, New Delhi.
- Paterson, J. C. K. (1910) : *Bengal District Gazetteers: Burdwan*. Bengal Secretariat Press, Calcutta.
- Report of the West Bengal Forest Committee (1939)* Forest and Excise Department, Government of Bengal. B.G. Press, Alipore, p. 44.
- Roy Chaudhury, R. (1996) : *Gender and Labour in India: The Kamins of Eastern coalmines*, Minerva, Calcutta.
- Shiva, V. (1988) : *Staying Alive : Ecology and Development in India*. Kali for Women, New Delhi.
- Mazumdar, V. (1975) : Editor's note' in S.N. Pande and G.P. Sinha. *Women Construction Workers: Report of Two Surveys*. Allied Publishers, Bombay.

Short Communications

AIR POLLUTION AND HEALTH HAZARD : A BRIEF REPORT OF OBSERVATION ON KOLKATA MEROPOLIS

In Kolkata (Calcutta), one of the largest metropolises in Asia, there is always a passion for modernisation, urbanisation and technological development without any proper planning in many respects. This trend has brought forth a marked deterioration in its environmental set up, particularly in its air quality. Total population of this metropolitan city has reached up to 14 times of its carrying capacity. Consequently large-scale industrialisation and automobilisation have now aggravated the problem of air pollution. It has now been placed among 41 most populated cities of the world in respect of the suspended particulate matter (SPM) as reported by the World Health Organisation (WHO) on global pollution and health.

The major source of pollution in this metropolitan city has been found to be the emission from automobiles. The city has about 1300 km length of motorable road, which can conveniently accommodate up to 250 thousand vehicles, but now over one million vehicles ply within its area every day. A comparison of the air quality data of the four largest metropolitan cities in India (Kolkata, Mumbai, Delhi and Chennai) shows that the air pollution level of Kolkata is higher than Mumbai and Chennai and is close to Delhi. There has been 65 per cent rise in the number of vehicles over the past ten years but the road space has not increased at all during this time span. Clinical examination and questionnaire survey on residents at various parts of this city and rural Bengal reveal that while 13.5 percent and 35 percent of the rural population suffer from upper and lower respiratory tract symptoms respectively the corresponding figure for Kolkata population are as high as 41.3 per cent and 47.8 per cent. Prevalence of respiratory disorders in the city is much more during the winter months when under dry condition in the atmosphere the pollution level remains high in the air. Persons occupationally exposed to higher level of air pollution, like street hawkers, traffic police personnel and garage workers suffer from much severe lung impairment. It has been found that about 40 per cent of the city's children suffer from respiratory distress syndrome (RDS). It has also been estimated that a 20 per cent reduction in air pollution from biomass combustion could reduce mortality from acute respiratory infection by 4.8 per cent.

Ms. Mahua Chatterjee

*Guest Teacher, Department of Geography, Surendranath College for Women
Kolkata 700009, West Bengal, India*

EAST CALCUTTA WETLANDS : FROM URBAN BACKYARD TO INTERNATIONAL ECOLOGICAL HOTSPOT

Kolkata is located on the eastern bank of the river Ganges. The city tilts from west to east. The landscape to the city's east and southeast is dotted with numerous ponds, swamps and low-lying, flood-prone marshy land. In a general sense, all this waterlogged territory consists of wetland areas. These nearly 12,000-hectare wetlands, recently identified as highly valued ecosystem in terms of economy, ecology, environment and health, are undisputedly the lifeline of Kolkata, representing a rare symbiosis between the city and the wetlands. One cannot survive without the other. Briefly summarised the reasons are: food, water, waste recycling, livelihood and biodiversity. The wetlands act as a giant water receptacle to store the city's runaway waters and thus help recharge the receding ground water of the locality. For years the city's entire sewage has found its outlet into the water bodies, where it gets self-detoxified. The locals to grow vegetables and rice then use these waters, which support enough dissolved nutrients. The wetlands, thus, purify the environment on the one hand and supply the food on the other. The entire waste recycling area is the largest ecosystem of its kind and does not merit comparison with any other such environment of the world. Moreover, being the largest remaining wilderness in the metropolitan area, it pumps surplus oxygen into the asphyxiating atmosphere of the city and hosts a good collection of flora and fauna, including rare birds, both resident and migratory (Furedy, 1987; Ghosh and Sen, 1987; Bhakat 1992, 1993; IW MED, 1995).

Considering the multifarious use of the wetlands, the state government plans out ruled eastern and southeastern expansion of the city (CMDA, 1990; State Planning Board, 1990; Dasgupta *et al.*, 1991). The only exception was the Township of Salt Lake that had been built on reclaimed wetlands. However, the West Bengal government has generally protected the wetlands. But the government is not organised in a way to deal with the issue efficiently. In the late eighties, several departments of the state had a stake in the wetlands but few were willing to pay for this use (IW MED, 1988). This multiple ownership over the ecosystem led to serious mismanagement problems typical of a common property resource. Therefore, it was becoming obvious that official policies were no longer to be taken seriously. And by the 1991, the list of newspaper reports about development reports on the Kolkata's eastern fringe had become long. The newly constructed peripheral road, the eastern bypass, had made the area easily accessible. It had become the chosen area for the land grabbers. This was in stark contrast to the well-argued reason not to urbanise this area.

During this time, a group of environmentally minded bureaucrats started to think that they were fighting a losing battle to save the precious wetlands. They briefed the urban NGOs and motivated them to start a campaign to raise awareness. Unfortunately these activists failed to mobilise a mass movement. In the wetland area social strife and labour unrest emerged out as a single deterrent to popular grassroots environmental activism. With this realisation, the NGOs finally decided to go to the court for the last succor. In early 1992, a Kolkata-based pressure group PUBLIC (Public United for Better Living in Calcutta) filed a writ petition in the city high court. Several copies of the wetland related government documents, which are largely inaccessible to the public, were annexed to the petition. The court was requested to direct the authorities to protect the wetlands.

The high court accepted the case. Thereafter, the proceedings went on fast. The court thought that the petition was in tune with the central government's wetland protection policy and the guidelines of international Ramsar convention to which India is a party. In the late September, the high court delivered a major judgment on the matter. The verdict ruled that the wetlands were a gift of nature and defined the court's job to strike a balance between development and environment. It emphasised that wetlands could only be reclaimed for developmental projects that would benefit society at large. In practice, a world trade centre and fair ground were thought to belong to this category. The wetlands, on the other hand, were too precious to be sacrificed for a mere township. Accordingly, the court decided to earmark a chunk of the area for these two schemes, thus not permitting other developmental works. The wetlands thus received a respite for *Public*, which was a major victory (Demboski, 1999).

After this landmark high court ruling, the network of environmentalists was making headway again. The proactive government officially proposed to the central government to declare some wetland areas, particularly the waste recycling zones, in east Kolkata as being of both national and international significance. The debate between conservation and reclamation remained alive. And over the next few years, dialogues on and struggles for East Calcutta Wetlands continued unabated. In 2002, the long East Calcutta Wetland movement finally managed to carve out a niche for itself in the form of a protected site. The Ramsar Bureau (the international headquarters of wetland policy research) has declared this waterlogged area a Ramsar site, a protected wetland earmarked for sustainable development and wise-use, a status that places it among other such internationally important ecosystems (*The Statesman*, 2002; *The Telegraph*, 2002).

Now with the inclusion in the list of global wetland hot-spots, Kolkata's all-time greed for land has received a well-timed check, destined to alter land-use equations on the wetland area. While the people of Kolkata should be rigorous in protecting the ecosystem, the government and municipal bodies should ensure that toxic pollutants are no longer pumped into the water bodies. A return to laxity and lackadaisical attitude after all fanfare would be truly suicidal. To achieve real success, wetland ecology must be tagged with the existing educational curriculum. Raising people's awareness of wetlands and convincing them of their real value will be another effective way of conservation. And scientists, activists and media have a clear responsibility in this regard, a responsibility to highlight just how important wetlands are, and in a way which non-scientists can understand.

References

- Bhakat, R.K. (1992) : Vanishing Wetlands - A Threat to Calcutta's Future. *The Statesman*: January 6.
- Bhakat, R.K. (1993) : Uses of Calcutta Wetlands. *Yojana*, January 15, pp. 17-19.
- CMDA. (1990) : 'Plan for Metropolitan Development 1990-2015'. Calcutta Metropolitan Development Authority, August.
- Dasgupta, B. *et al.* (1991) : *Calcutta's Urban Future*. Govt. of W.B.; Calcutta.
- Demboski, H. (1999) : Courts, Civil Society and Public Sphere-Environmental Litigation in Calcutta. *Economic and Political Weekly*: January 9, pp. 49-56.
- Furedy, C. (1987) : From Wasteland to Waste-Not Land: The Role of the Salt Lakes, East Calcutta in Waste Treatment and Recycling, 1845-1930. In *The Urban Experience* (ed.) Sinha, P., Ridhi India, Calcutta, pp. 145-153.
- Ghosh, D. and Sen, S. (1987) : Ecological History of Calcutta's Wetland Conversion. *Environmental Conservation*: 14: 219-226.
- IWMED (1988) : Management of Urban and Peri-urban Wetlands. Institute of Wetland Management and Ecological Design. Calcutta.
- IWMED (1995) : Integrated Study on Wetland Conversion and Urban Growth. Institute of Wetland Management and Ecological Design. Calcutta.
- State Planning Board (1990) : A Perspective Plan for Calcutta : 2011 (draft), Govt. of W.B., Calcutta.
- The Statesman* (2002) : Kolkata Wetland on World Map, November, 28.
- The Telegraph* (2002) : Global Arm of Protection for Wetlands. November 29.

Dr. Ram Kumar Bhakat

Department of Botany and Forestry
Vidyasagar University
Medinipur 721102, West Bengal, India

EVIDENCES OF ENVIRONMENTAL CONDITIONS OF THE ANCIENT COASTAL CIVILIZATION OF TAMRALIPTA, WEST BENGAL

Ample historical evidences have been preserved in different parts of the world to show that distinct local environmental changes associated with the shifting of navigable river channels and sea coast-lines have played a vital role in the extinction of regionally and locally developed human civilisation as the civilizations Egypt (Africa) in the Nile River basin and Mohenjodaro-Harappa (Indian Subcontinent) in the Indus River basin. Similar evidences, although at a smaller scale, can also be cited from certain areas of lower Bengal basin. Historians support the view that Tamralipta (also named as Tomolipta, Tamolipta, Belakul, Tamalika, Tamalipta, Tamalini, Bishnugriha, Ratnakar, Ratnabatipur in various ancient literatures and presently known as Tamluk) was a very rich coastal port and a trade centre of South Bengal in the past, even before the birth of Lord Buddha (544 BC). Various evidences show that till 8th century Tamralipta continued to play as a 'Gateway of India' and a major trade centre of Eastern India. The famous ancient port of Tamralipta now observes only a passing mention in the texts of history. It will be very interesting if one attempts to explore how this rich and prosperous port lost its fame with the gradual change of the estuarine environmental conditions around the mouth of River Hooghly.

Location of the Study Area :

Ancient Tamralipta civilization is supposed to have occurred around the areas of present Haldia to Nandigram, Bhagabanpur, Mayna, Sabang, Pingla, Debra, Panskura, Mechada, Natshal and Kolaghat areas of East Medinipur district. Presently Tamluk township, which is situated on the western bank of Rupnarayan River, has been designated as the headquarter of East Medinipur District. This area covers about 1950 km² within 21°55' N -21°31' N latitudes and 87°38' E - 88°11' E longitudes. Geologically this area falls within the southwestern part of Western Geo-province of Bengal basin, which includes the geographical areas West Bengal alluvial plain and Foredeep basin, alluvial plains of Bangladesh and Foredeep basin of Bhutan (Banerjee 1998).

Late Holocene Shoreline Change in Western Geo-Province :

Climatological evidences show that 6000 years ago the average temperature was nearly 2°C higher than present and there was higher precipitation (Siddhartha 2001, 377). It was known as *Holocene Climatic Optimum*. During this period the sea level was nearly 60-70 Km inland in southern part of Bengal (Niyogy 1970).

Present Tamluk (Tamralipta) sector must have been a newly developed coastal area at that time. With gradual climatic amelioration the sea level fell slightly and thus retreated. Except a little rise during *Little Climatic Optimum* sea level had a tendency to become lower. This caused seaward retreat of shoreline of Bengal, which actually started, from 1200 AD at a distinct rate.

Evidences of Sea Level Fall during late Holocene period :

Evidences of sea level fall and seaward shifting of shoreline have been detected from the remains preserved under the surface of this area. Green marine mud and sediments have been found near Kolaghat-Mechada, Damdam and Calcutta which indicate sea level transgression and regression during Holocene period in Western Geo-province (Banerjee, 1998).

Present Shoreline Study for The Evidences of Early Sea Level Fall :

Most interesting geomorphic evidences of early sea ward shifting of shoreline and sea level fall have been recorded along the present coastlines of Medinipur district near Digha-Sankarpur coastal tract. Digha-Sankarpur coastal tract developed within last 6000 years with the sea level fall after Holocene climatic optimum. Geological history of this area indicated that Digha-Sankarpur coastal tract has been formed by sand nourishment of Subarnarekha River (Bandyopadhyay, 2000). On the basis of the pattern sediment deposition this area can be classified into three geological units, namely: I. *Ancient Digha-Junput coastal deposit* (developed during 5870 ± 140 Yrs. B.P), II. *Older Digha-Junput coastal deposits* (developed during 2920 ± 60 Yrs. B.P.), and III. *Recent Digha-Junput coastal tract* (G.S.I. 1995).

From the evidences it becomes clear that the coastline of Medinipur shifted southward causing a drastic physical environmental change in this part of lower Bengal. The previous coastal environment changed to an inland environment, the landscape of which is now reworked mainly by the river-born alluvial deposits.

Historical Evidences of the Development of Coastal Civilization of Tamralipta :

L.L.S. O'Malley, in his scholarly and informative book, *Bengal District Gazetteers, Midnapore* (1911) wrote that Tamralipta was mentioned in the Jaina, Buddhists and Brahmanical Sanskrit works and it must have been in existence even before the birth of Christ. Tamralipta was first described in the great ethic of India, Mahabharata in Adiparba-18th chapter and Sabhaparba-29th chapter. It is well accepted that Mahabharata was written nearly 1000-500 BC. Ptoemy (*circa* 150

AD) noticed Tamralipta (*Tamalites*) as a vital port of eastern India (O'Malley, 1911). Chinese pilgrims Fa-Hian (405-411 AD) described it as being on the sea mouth. He described Tamralipta as a coastal state. During 7th century Hiun-Tsiang wrote that Tamralipta port was situated near an inlet and only 2-km inland from the sea (O'Malley, 1911; Bari 2000). The difference in observation between these two authors about the site and situation of Tamralipta port in two different time periods can be used as a historical evidence of southward shoreline shifting through centuries.

All these historical evidences prove that this coastal civilization developed at Tamralipta at least 2000 years ago. However, from the 8th century the port of Tamralipta started losing its importance and subsequently the civilization of this area, which was basically coastal in character lost its original character.

Trade through the Coastal Port :

Various historical and archeological evidences show that Tamralipta had a wide field of export and import trades with the countries of different parts of the world. The main exporting goods were *Maslin* cloths, cotton textiles, rice, indigo, fancy pots, *Pan* (Betel leaf) from the lower Ganga plain; and Tobacco and wood from Orissa. Wood from *Jangle Mahal*, lumbering goods, copper and copper ornaments from *Dhalbhum* (Chotanagpur), skin and horn of Rhinoceros from Assam, gold from Brahmaputra and Subarnarekha basins, sea-parl, dry fish, coconut etc. from the adjacent coastal areas. Through Tamralipta port traders used import jewels, spice and sandalwood (from south India and from Malay, Sumatra and Java), silk (from China), Ivory, fancy goods from (China and Japan) and Harpoon and other fishing instruments (from distant countries like Rome and Greece). This suggests how important was Tamralipta port and how resourceful was the ancient Tamralipta coastal civilization until it lost its glory.

Physical Environmental Causes Behind the Loss of Tamralipta Coastal Civilization :

There may be many political and social reasons for the deterioration in the level of importance of Tamralipta Port Township. But the shifting of shoreline towards further south was certainly a major contributing factor. Due to the increase of sediment deposition with the seaward shifting of shoreline, the environmental condition changed totally which influenced the biological and human environment. According to some historians Tamralipta went into the River Rupnarayan due to the course change of this river and thus the estuarine port of Tamralipta disappeared (Bari, 2000). It can be suggested that the change in the

rate of water discharge through River Rupnarayan was due to climatic change during 800-1200 AD.

Acknowledgements : Authors are grateful to Prof. Dr. Guru Prasad Chattopadhyay, Department of Geography & Environment Management, Vidyasagar University, Medinipur for his technical advice and valuable editorial notes on the manuscript of this paper. The authors also sincerely acknowledges the cordial help received from the members of staff of Midnapur District Library for giving access to historical documents and records.

References :

- Banerjee, M. (1998) : Appraisal of Trend of Coastal Zone Evolution in The Western Geo-Province Of Bengal Basin in Relation to Present Day Coastal Zone Problem Consideration. Coastal Zone Problems: Proceedings of the National Workshop, March 20-22, page-10-35.
- Geological Survey of India, Eastern region (1995) : Interim Report on The Coastal Zone Management Digha planning area (Hotel Sea Hawk to Orissa border) of Digha development Authority, Medinipur district, West Bengal: Page: 3-10
- O'Malley, L.S.S. (1911) : Bengal District Gazetteers. Midnapore. 1995 reprint. Government of West Bengal, Calcutta, P-25. 265-268.
- Niyogy, D. (1970) : Geological Background of Beach Erosion of Digha , West Bengal , Bulletin , Geology Mining and Metallurgical Society of India Vol.43 Page: 1-36.
- Bari, R. (2000) : The Tamralipta National Government (in Bengali). Published by Sushil Kumar Dhara, P-15.

Sudip Dey

Ph.D. Research Scholar
Department of Geography, Vidyasagar University,
Medinipur 721102, West Bengal, India
 E-mail: deysudip@indiatimes.com

Rajib De

Business executive
National Institute of Information Technology, Balichak Centre
Medinipur 721124, West Bengal, India
 E-mail: yaman.kalyan@indiatimes.com

Book Review

Of Myths and Movements : Rewriting Chipko into Himalayan History by H. Rangan; Oxford University Press, New Delhi, 2001, pp. XVI + 272, Rs. 595/-

The Chipko movement of the Uttarakhand (Gashwal Himalaya) is one of the best known and well-publicised environmental actions in India. Originating in the Garhwal region of the Himalaya as a grassroots level protest movement against cutting a few trees, the movement reached its climax in the mid-seventies. Thomas Weber (1988), an Australian scholar of Politics, while introducing his book *Hugging The Trees : The Story of Chipko movement*, writes, "There is, however, no one movement with a constitution or elected leaders. Rather, the movement is a reaction to threatening circumstances, sometimes guided by Gandhian *Sarvodaya* (social) workers and sometimes arising spontaneously. The various activists may be connected or received inspiration from each other, or the actions may spring up independently as a local situation deteriorates to the extent where illiterate villagers decide on the need to make a stand in order to ensure survival. The movement aims to bring man back into living harmoniously with nature, to provide economic survival for the local hill people, to undertake reforestation work and to increase environmental knowledge and caring with the population at large ..."

The author says, "A BBC documentary film has been based on this Chipko andolan, it has been mentioned approvingly in the *Time* magazine and India's *The Illustrated Weekly* has included the advent of Chipko in its list of The Ten Most Momentous Events since India Won Freedom (along with assassination of Mahatma Gandhi, the liberation of Bangladesh, the lifting of the Emergency imposed by Indira Gandhi etc.) and its two leading lights Sunderlal Bahuguna and Chandi Prasad Bhatt, in its list of Fifty Indians Who Matter. The movement, once branded as an anti-scientific and troublesome phenomenon, is now hailed as an example of constructive environmental protection activism. It is widely covered in the Indian press and international ecological journals, its leaders are regularly asked to address high-level government committees and scientific conventions, and the word Chipko is now almost a household word in India."

Since its origin in the early-seventies, an impressive and useful literature on the movement also abounds in. But recently, the Chipko movement has attracted the attention of several scholars, both national and international, who are trying to analyse the changing faces of the movement. And in this process, it has been

transformed from an event of profound historical significance into a myth. In this metamorphosis, argues the author of the book under review, many chroniclers and authors have forgot the history of the region that gave birth to the movement. As a result, there also appear some serious gaps in the public impressions and actual realities of the movement. And over the last few years, a small number of scholars have started writing critiques on the movement. These criticisms revolve around insufficient attention paid to the socio-political and economic context of Chipko protests in proper historical and geographical perspectives. Moreover, there is a general mood of consensus that very little is left of the movement in its cradle save the memory. And therefore, in its very birthplace the movement is spoken in the past tense.

Considering all this, the book attempts to put Chipko in its geographical setting through dissecting the historical geography in particular. The author argues that Chipko like many other social movements has many voices. It was region in protests and therefore it is pluralistic in character. The purpose of the book, says the author, is two fold. First: the narrative illustrates how Chipko as myth has influenced people in various parts of the world in general and has affected the society, politics, environment and development of Uttarakhand in general. Second : the book as its sub-title indicates tries to explore the new meanings and insights gained through writing the Chipko from the realm of nature into Himalayan history. The book is intended to cater to the needs of diverse disciplines – all interested in exchanging views when the question of development and democracy crops up.

The book is divided into eight chapters. These are: *Myth and Marginalisation*, *Passages from History to Nature*, *Naturalised Himalaya*, *Himalayan Backwardness*, *Biogeography of Control*, *Development in the Margins*, *Chipko's Movements* and *Regional Questions and Sustainable Development*. As the author says, "The first chapter uses Chipko as an exemplar to show how history and myth interact and how historical events are transformed into myth through narratives. The second chapter focuses on narratives, and Chipko narratives in particular, to explore the ways in which they are constructed so as to gain power and authority to influence political processes and change material practices. The third chapter explores the ways in which interactions in the Himalayas between humans and nature are represented through social and ecosystem models, discusses their strengths and limitations, and provides an alternative theoretical approach for understanding and employing the analytical framework of political ecology. The fourth chapter focuses on facets of 'the state' – precolonial, colonial, and postcolonial – in Garhwal and Kumaon Himalaya and argues for the need to

examine the historical contexts within which forms of governance, dominant policy phases, and actions of different state agencies are shaped within particular spatial and political configurations. The fifth chapter, focusing on forestry and the activities of the Imperial Forest Service, reexamines concepts of property, access, and control in Garhwal, all of which inform contemporary discourses of sustainability and sustainable management of natural resources. It reinterprets the ways in which differentiated means of institutional control over access to resources shape both the biogeography and economic opportunities for various social classes within the region. The sixth chapter explores the ways in which concepts of development, nationalism, and democracy have been imbued with new meanings in postcolonial India, and how the interactions of these contextually translated concepts reproduce or transform social and economic processes occurring within the existing political and spatial configurations of the region and nation. The seventh chapter, returning to Chipko, discusses the role of social movements – old and new – in reshaping the relations of power and material practices. It provides an alternative understanding of social movements by focusing on the ways in which popular mobilisation occurs through discursive strategies that link the identities of individuals with particular social roles. It shows how successful discursive strategies may, in some fortuitous instances, bring widespread recognition to social movements but simultaneously fail to deliver the material and institutional changes desired by their participants. The final chapter brings all these themes together to examine the concept of sustainability and sustainable development. It discusses the problems of presenting sustainability as global-local discourse, and argues instead for the need to view sustainability as a regional question that seeks possible ways and means for ensuring accessibility of resources for all social classes within regions. It offers an alternative perspective on sustainable development as a regional process in the continuity present where institutions of state and civil society are coupled in a bitter-sweet liaison that requires constant negotiation, adjustment, and reworking of their mutual commitment to substantive democracy and accessible development."

What seems to be refreshing about the book is an attempt to find out the plausible relationship of Chipko movement with a more recent social mobilisation in the Uttarakhand hills – the Uttarakhand movement. And by doing so, the author illustrates how environment, society and politics in India interact for sustainable regional development and substantive democracy.

Although Chipko was not directly associated with the Uttarakhand movement seeking a new hill state, it had always extended moral support to the agitation.

With the Chipko gaining felicitous victory after a protracted struggle, the post-Chipko solutions bred other problems in the hills. The government-imposed environmental legislation in the sensitive areas of the hills was deeply resented by the local people who viewed "environment and ecology" as largely idealistic but not much more effective in solving the immediate socio-economic problems. A separate state for greater autonomy was considered more urgent than establishing a harmonious relationship with nature. A new state was deemed to be of harbinger of prosperity. It was thought to provide more autonomy and therefore control/say over local resource base and hill-based developments which were receiving inadequate attention in the plains-based planning of distant Lucknow. Thus, Chipko-Uttarakhand combine, argues the author, took up the unfinished agenda. Despite their many differences, the Chipko and Uttarakhand movements have overlapping agenda in terms of forest use, environment and governance. Yet the two movements evolved separately. While Chipko, the book rightly argues, became a symbol of environmentalism, the Uttarakhand movement is a voice of dispossessed for sustainable regional development.

The book, for its multidisciplinary approach, is extremely relevant for anthropologists, botanists, ecologists, sociologists, economists, historians, geographers, political scientists, foresters, planners, policy-makers and activists.

Ram Kumar Bhakat

Department of Botany & Forestry

Vidyasagar University

Medinipur 721102, W.B., India.