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Climate Change Adaptation : an approach with conservation of wetland

Climate is changing rapidly, the impacts will grow in multiple stresses at different spatial and temporal scales on the biophysical as well as social environment. It will profoundly affect the entire population and subsequent generations. Today's challenge is to slow the climate change, to reduce its vulnerability and adapt to it. The 4th assessment of the Intergovernmental Panel on Climate Change (IPCC) in 2007 had devoted a volume of its assessment to climate change impacts, adaptation and vulnerability. Adaptation as defined, is the response to actual or expected climate stimuli that moderates harm or exploits beneficial opportunities. Simply, it is the ability of people and systems to adjust to climate change. Its mechanism may refer into two systems i.e.

- natural system, which is reactive;
- human system, which is both anticipatory and reactive.

The conceptualization of adaptation or enhancement of adaptive capacities is the notion of vulnerability and resilience. Vulnerability in climate change adaptation is the concept, described as a condition of susceptibility shaped by exposure, sensitivity and resilience. On the other hand, resilience refers to information and communication technology (ICT)

like skills, processes, institutions, social systems and policies & programmes.

Both the adaptive capacity and resilience ultimately depends on

- Education, the knowledge base required to develop new systems when existing ones are disrupted;
- Flexibility within livelihood, economic, water management and institutional systems;
- Mobility an attribute of flexibility;
- Diversification involving multiple independent flows to livelihood systems;
- Ability to learn from events through individual as well as institutional level;
- Risk pooling, spreading, operational techniques for reduction before disruption; etc.

The strategies for Climate change adaptation in Manipur at present has become a matter of concern for the state. The recored mean ambient temperature is apparently found to have been increasing by 0.2 to 0.4 °C and the total annual rainfall also varying from 876 mm to 2217 mm, during the last 40 years i.e. 1969 - 2009. In the changing scenario of climatic pattern of the region, impacts are mostly reported in agriculture, biodiversity and health, etc. As a result many sensitive indigenous species are reported to

be in threatened status. The Environment & Ecology Office in collaboration with different government departments/agencies have already initiated to take up, certain commendable steps for climate change adaptation programmes in few sectors. Of which, wetland conservation & protection activities is one of the major climate change adaptation strategy and action plan in the state. Other identified sectors considered suitable for the region are natural resources management, biodiversity conservation, water resources management, and agricultural sectors with adaptive modalities, etc.

Climate variability and Wetland Ecosystem:

Climate change threatens wetlands, riparian areas and floodplains in a number of ways. Temperature - sensitive plant and animal species will not be able to survive in the increased temperatures. Increase in precipitation, to occur in some areas, will flood wetlands, and decrease in precipitation will decrease the size or destroy playas, vernal pools and other types of wetlands. Rising temperatures and reduced water levels will also release carbon from wetlands.

Climate change, therefore, cannot be taken as a mere issue for wetland, riparian area, and floodplain management. What is required at this



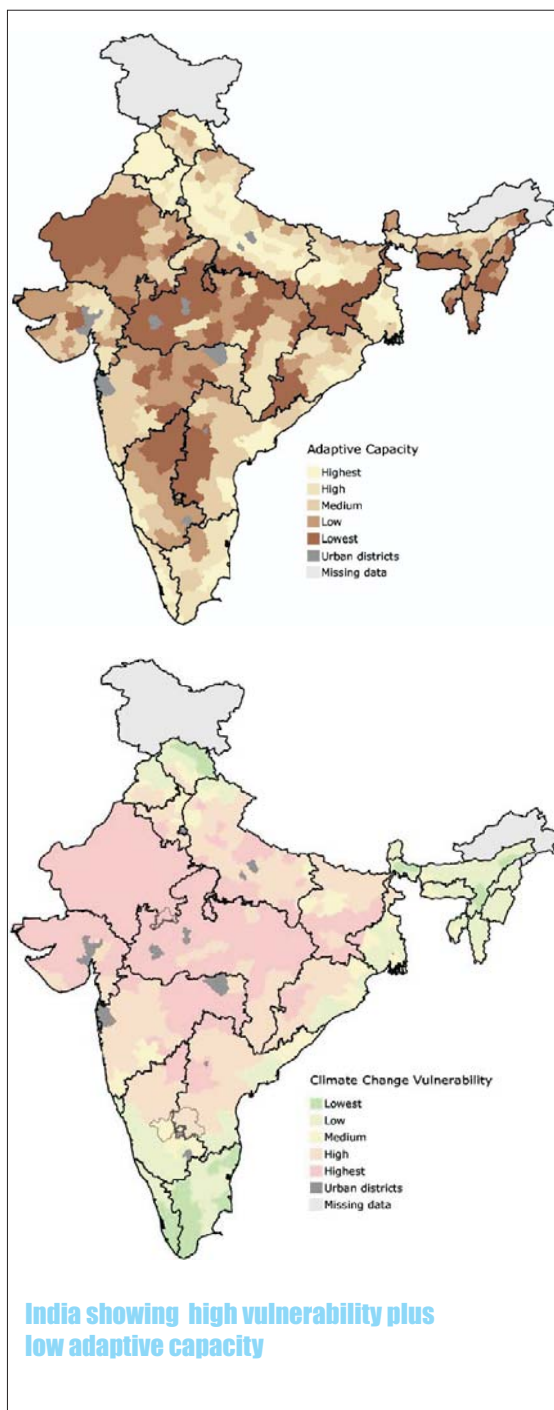
Livelihood of wetland peoples in Manipur

junction is to understand the status of scientific knowledge concerning it and to address the existing wetland management and conservation challenges. There also may need to make adjustments in wetland, riparian zone, and floodplain management to reduce impacts and to both store carbon and reduce methane generation while serving broader wetland, riparian, floodplain and stream protection and restoration goals. Regional/State level/National level discussion on current issues in wetland science, policy and

management in combination with more speculative dialogue on how to respond to climate change may help participants develop strategies to anticipate and adapt to regional changes in climate. Many parties to CBD in its fourth national reports under the convention on



Livelihood of a wetland dependent woman looking for Thambou (Rhizome of *Nelumbo nucifera*, L.N. Thambal) during leaned seas



Biological diversity have recognized that the loss of wetland services has increased their vulnerability to weather extremes, at considerable economic cost. Wetlands play a key role in combating the emission of greenhouse gases, the primary driver of climate change. Although wetlands cover only six per cent of the Earth's land surface they store about 35% of global terrestrial carbon. Peatlands are the most efficient carbon stores of all terrestrial ecosystems. They store twice the carbon present in forest biomass of the world and the term of storage is very long, contrary to forests. Many wetlands also store large quantities of methane, a particularly potent greenhouse gas. The better caring of wetlands is a sensible, and often cost-effective way to reduce these emissions. Besides these, healthy wetlands also play a central role in regulating the water cycle.

The 9th meeting of the Conference of the Parties (COP) to the CBD held during May 19-30, 2008 in Bonn, Germany recognized the Ramsar Convention's pre-eminent leadership in

relation to wetlands and the need for strengthened scientific as well as policy guidance regarding their role in climate change & importance for wetland conservation. This joint approach of CBD and the Ramsar Convention is being expected as a great achievement to respond to the climate change and confidence for remarkable outcomes are there in the forthcoming COP 10 on CBD, to be held from 18 to 29 October 2010 in Nagoya, Japan.

Wetland Conservation in National Action Plan for Climate Change in India :

The National Action Plan for Climate Change (NAPCC) in India has given emphasis on the conservation of wetlands under the national water mission, of which is also a national action plan. With due recognition of its wise use & multi functional approaches like ecological services, water conservation, recharge of underground water, preservation of flora & fauna, source of livelihood, etc., conservation of wetland has become one of the major approach for climate change action plan.

Wetlands face the threat of conversion to other uses, with losing of its ecological services, thereby making vulnerable to those who depend on them. Therefore, Environmental appraisal & impact assessment of developmental projects on wetlands, inventory of wetlands, mapping of catchment, land use pattern study, awareness about the importance of wetland ecosystem, etc. may be considered as some of the major identified actions for conserving wetlands in the context of Manipur..

RESEARCH ABSTRACT

Indian J. Environ. & Ecoplan 10(2): 537 540 (2005)

Investigation on Physico-Chemical Condition of Major Effluent points of Nambul River, Manipur, India.

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Nambul river is the most polluted river in Manipur flowing through the heart of the city. Physico-chemical analysis of major effluent points in the greater Imphal area were studied for one year from January to December 2003 to assess the level of pollution in three major different effluent points of Nambul river. These three effluent points are mainly responsible for collection of sewage and solid waste from in and around the greater Imphal area and pour it out into the Nambul river. From the studies, it reveals that the distance of 3 (three) kms river course flowing into the heart of the city received the maximum loads of pollutant from the above effluent points and it may consider to be the most polluted area in the Nambul river course, even the level of DO was found only 0.2 ppm in these 3 (three) different effluent points in the month of October.

Keyword: Effluent, Nallah, BOD, Nambul river.

TIME SERIES ENVIRONMENT DATA

Water Quality of Some Lakes of Manipur during January - March 2010

Sl. No.	Parameters	Sites/Lake							
		1	2	3	4	5	6	7	8
1.	pH	7.20	7.06	7.26	7.32	7.70	6.89	7.06	7.16
2.	B.O.D. (mg/l)	3.46	3.10	3.57	3.46	3.21	3.62	3.21	3.46
3.	C.O.D. (mg/l)	8.49	6.76	8.49	8.49	7.76	7.46	7.46	7.76
4.	Nitrogen (mg/l)	1.56	1.86	1.91	1.06	1.52	1.16	1.21	1.42
5.	Phosphorous (mg/l)	1.08	1.52	1.56	0.97	1.26	1.06	1.46	1.07
6.	Potassium (mg/l)	3.00	4.00	4.00	3.00	3.00	3.00	2.00	3.00
7.	Total Coliform/100ml	820	720	610	680	710	680	610	670
8.	Fecal Coliform	470	310	300	370	360	320	300	260

Sites:- 1. Loktak 2. Ikop 3. Waithou 4. Angoubikhong 5. Kharungpat 6. Pumlen Pat 7. Sanapat 8. Utrapat

DISTRICT PROFILE

Bishnupur District



The Bishnupur District having a total geographical area of 530 Sq.Km bears some unique and important topographical features. Some of the major wetlands of the state are located in this district. Loktak, the biggest fresh water lake in the north east India and the Keibul Lamjao National Park, a unique floating wild life sanctuary in the world and the original home of the Sangai or the Brow Antlered Deer (*Cervus eldi eldi*) are situated in the district. The district being a plain area enjoys the pleasant climate. Influenced by the Loktak lake. The range of temperature for the district is 2°C to 35°C. The district enjoys adequate amount of rainfall. Virtually most of the rainfall occurs during the period from April to October and the average rainfall record at Bishnupur, the district H.Qr. is 1204.2 mm. A variety of fauna is found in the district.

Birds found in the district are carrion, crow, house sparrow, tree sparrow, hedge sparrow, robin, hoopoe, king fisher, wood pecker, little owl, town owl, kite sparrow hawk, plover, sterling, etc. Different species of swan and duck mallard duck, cormorant, hornbill etc are reported to have seen in Loktak Lake area.

The district is rich in vegetation which is varied in character. In the Loktak lake of this district, water chestnut or Heikak in local version is found in abundance. Giant Water lily (Thangjing) grows wild or planted at the shallow portion of the lake.

Major Land Use / Land Cover Categories(1989-90)

Sl. No	Category	Area (Ha)	% to the total District Area
1.	Settlement	6139	11.58
2.	Agricultural Land	26138.6	49.32
3.	Forest Cover	662.5	1.25
4.	Land with /without scrub	1618.46	3.05
5.	Water Bodies		
	(a) Group - A	9610.4	18.13
	(b) Group - B	6267.7	11.83
6.	Others	2563.4	4.84

Source : Manipur Remote Sensing Application Centre

Some of the most commonly found trees in the district are *Aibizzia* Spp. (Khok), *Artocarpus Hirtuta* (Heirukokthong), *Salmulia malaburica* (Tera), *Castanopsis* (Sahi), *Mangifera indica* (Heinou). Mention may be made of *Parkai-Roxburgil* or tree bean (Yongchak) which is planted everywhere. The fruit at this tree is considered to be one of the delicious items of food by the people of Manipur. Bamboo and reeds are also found plenty.

BIODIVERSITY OF MANIPUR

Acorus calamus L.

Family : **Araceae**

Local name: 'Ok-hidak' (Manipuri), 'Safed-bach' (Hindi), 'Sweet flag'(English)

Status & distribution: Rarely planted as well as grows wild in swampy areas.

Brief description: It is a hydrophyte. The underground stem or rhizome is succulent and is yellow in colour. The leaves are grass like and lush green in colour. The inflorescence is made up of a cluster of tiny flowers borne on the apical or terminal part of a long stalk.

Ethnomedicinal uses: Cough, chest congestion, worm affection, dizziness, aching and pain.



Acorus calamus L.

Ageratum conyzoides L.

Family: **Asteraceae**

Local Name: 'Khongjainapi' (Manipuri); 'Goat weed'(English)

Status and distribution: Commonly grows along dried up streams, low moist situation and swampy areas on roadside and homestead compounds.

Brief description: It is an annual herb having erect branched stem; leaves are opposite or the upper are alternate, broadly ovate, sub-acute and more or less hairy on both sides and the heads are small in dense terminal corymbs and flowers are pale blue or white in colour.

Ethnomedicinal uses: Cuts, wounds, boils, hair care, dizziness, headache, migraine, abdominal pain and inflammation.



Ageratum conyzoides L.

Aegle marmelos (L.) Correa

Family : **Rutaceae**

Local Name: 'Heikhagok' (Manipuri); 'Bel'(Hindi); 'Stone apple'(English)

Status & distribution: Occasionally cultivated as a fruit crop.

Brief description: It is a medium sized tree. Leaves are alternate, trifoliate or digitately 5-foliolate. Flowers are sweet-scented, stalked and solitary or few flowered in axillary or terminal cymes. Fruits are usually globose and pericarp is nearly smooth and greyish yellow that is filled with softer tissue.

Ethnomedicinal uses:

Diabetes, diarrhoea, dysentery, high body temperature, liver complaints, acne, jaundice, cough, tonic leucorrhoea, gynaecological complaints and menstrual disorders.



Aegle marmelos (L.) Correa

Alocasia macrorrhiza (L.) Schott.

Family : **Araceae**

Local Name: 'Hongoo'(Manipuri); 'Mankando'(Hindi); 'Giant taro'(English)

Status and distribution: Commonly planted in domestic compound and also grows wild in wastelands.

Brief description: It is a robust herb; leaves are broadly ovate-sagittate, repand, broad and deeply cordate. Spathe is long with the tube about half as long as the coriaceous hooded cymbiform cuspidate pale green limb. Spadix is nearly as long as spathe which is sinusously sulcate.

Ethnomedicinal uses: Whitlow, paronychia, knee joint pain, leucorrhoea, coolant in burns, dizziness, migraine headache.



Alocasia macrorrhiza (L.) Schott.

In focus :**WETLAND CONSERVATION STRATEGY AND ACTION PLAN IN MANIPUR**

In response to the National Action Plan for Climate Change (NAPCC), Government of India has initiated many approaches towards climate change adaptation as well as mitigation strategies in collaboration with other international institutions. Adaptation to climate change

drought prone areas of Central and South India.

During May 2009, the Department of Economic Affairs (DEA), Ministry of Finance, Government of India, presented 5 different proposals

Actions identified for conserving wetlands under the National Water Mission of the National Action Plan for Climate Change are

- Environmental appraisal and impact assessment of developmental projects on wetlands;
- Developing an inventory of wetlands, especially those with unique features;
- Mapping of catchments and surveying and assessing land use patterns with emphasis on drainage, vegetation cover, silting, encroachment, conversion of mangrove areas, human settlements, and human activities and their impact on catchments and water bodies;
- Creating awareness among people on importance of wetland ecosystems;
- Formulating and implementing a regulatory regime to ensure wise use of wetlands at the national, the state, and district levels;

requires integrated solutions that simultaneously address livelihood improvements and environmental sustainability. Proactive measures for adaptation to climate variability and change can substantially reduce many of the adverse impacts, and thus contribute to livelihood security of the vulnerable rural population. Enhancement of adaptive capacity is necessary for reducing the vulnerability of rural poor. Hence, adaptation to climate change is critically important. International donors, notably World Bank, the United Kingdom's Department for International Development (DFID) and Swiss Development Cooperation (SDC) are implementing / preparing climate change adaptation programmes in India. Most of them are currently focussing on the

from 5 (five) NE State of India namely, Assam, Manipur, Meghalaya, Nagaland and Sikkim during the Indo-German Government consultations. The proposals are on climate change adaptation approaches to improve livelihood and ecological resilience of the rural population of the state. The programme comprises of four components as

- i. vulnerability and adaptation assessment (VAA) and technical packages,
- ii. climate proofing,
- iii. financial instruments (especially insurance models), and
- iv. Information and knowledge management.

Conservation of Wetlands in Manipur :

Maximum of wetlands in Manipur are in the state of dying and process

of shallowing or utilized for other non wetland purposes. Erosion of catchments area, siltation, eutrophication, settlement, etc. are the major contributing factors to the loss of wetland in Manipur.

With a serious view to address the issue of degradation of wetland ecosystem including all the water bodies in Manipur, the state Government has taken up certain conservation as well as restoration measures in some of the important wetlands. In July 2009, a High Level committee under the chairmanship of Chief Minister, Manipur to address the modalities on inventorization, protection, conservation and preservation of the wetlands / lakes / water bodies, etc. of Manipur State has been constituted by the Government. The criteria for identification of wetlands can be attributed to the following three main factors, viz.

- When an area is permanently or periodically inundated;
- When an area supports hydrophytic vegetation;
- When an area has hydric soils that are saturated or flooded for a sufficiently long period to become anaerobic in the upper layers.

The 1st Steering Committee meeting, held on 21st December 2009, focused on 2 (two) major issues like

- identification & prioritization of the wetlands / lakes / water bodies of the state for notification as protected area; and
- strategies for preparation of state policy on protection, conservation and preservation of wetlands / lakes / water bodies, etc.

The steering Committee identified 19 natural wetlands for want of immediate conservation action plan.



ENVIRONMENT EVENTS

February 2, 2010 : World Wetlands Day

2 February each year is World Wetlands Day. It marks the date of the signing of the Convention on Wetlands on 2 February 1971 in the Iranian city of Ramsar on the shores of the Caspian Sea. WWD was celebrated for the first time in 1997, an encouraging beginning. Each year government agencies, NGOs and groups of citizens at all levels of the community have taken advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits and, in particular, of the Ramsar Convention.

From 1997 to 2009, the Convention's website has posted reports from more than 98 countries of WWD activities of all sizes and shapes, from lectures and seminars, nature walks, children's art contests, sampan races and

community clean-up days, to radio and television interviews and letters to newspapers, to the launch of new wetland policies, new Ramsar sites and new programmes at the national level.

With the suggested World Wetlands Day theme for this year on wetlands, biodiversity and climate change, the 2010 WWD slogan is: 'Caring for wetlands - an answer to climate change'.

A critical climate change meeting of the world's leaders in Copenhagen at the end of 2009 and January 2010 beginning the International Year of Biodiversity. Climate change and biodiversity will definitely be hitting the headlines in the year to come. There is much to say at global and national levels about wetland species



and ecosystems under continuing threat from unsustainable human practices, about the likely impact of climate change on wetland ecosystems and, importantly, about the role of wetlands in climate change mitigation and adaptation.

ENVIRONMENT NEWS

Meet educates on environment

..... Coupled with the deteriorating environment of the lake, hunting migratory birds for food and money contributed a lot in the alarming decrease of the number of migratory birds, pushing some species to the brink of extinction. Some of the birds which used to migrate to Loktak lake during winter but no longer visible or whose numbers have drastically decreased are Thoidingam, Nганu Khara, Shurit, Shadang etc. Indigenous species of birds which are on the verge of extinction are Uthum, Uren, Umu etc.....

[Source: *The Sangai Express, Imphal, January 11, 2010*]

Wetlands shrink in the face of urbanisation

..... Wetland areas of Manipur where fishing activities can be taken up naturally has shrunken from one lakh hectare in 1993 to 56,491 hectare today, thus recording a loss of over 40,000 hectares in the face of increasing human population, siltation and urbanisation.....

[Source: *The Sangai Express, Imphal, Feb 1, 2010*]

Sangai population below 100

Sangai, one of the rarest deer species and only available in Keibul Lamjao National Park in their natural habitat is facing imminent threat of extinction. The total number of the State animal is below 100. There is also an incompatible variance in the numbers of Sangai given by the State

Government and the Wildlife Institute of India (WII).
[Source: *The Sangai Express, Imphal, January 12, 2010*]

133 wetlands vanished in four decades

..... Deforestation and vanishing wetlands have drastically affected the environment in state. The only means to save the mankind from the impending dangers is to protect the forests and the wetlands, to reduce use of fuel and energy, etc,

Previously there were 155 lakes in Manipur. Out of these, 133 had vanished. Now only 19 lakes are remaining. While all the lakes were intact, the total areas of water used to be 52,959 hectares. But now it has been reduced to 10,661 hectares only, which is really frightening. According to latest study report of state Environment and Ecology Wing, only Pumlun (Khoikum) Pat (lake), Ekop (Kharung) Pat, Loushi Pat, Waithou (Punnem) Pat, Ahongbeekhong Pat, Ushoipokpi Pat, Sana Pat, Utra Pat, Tena Pat, Kharam Pat, Lamphel Pat, Yaral Pat, Heingang Pat, Jaleng Pat and Loktak Pat are surviving but they are also on the verge of extinction at fast rate.

..... The wetland ecosystem is degrading day by day and partially becoming agricultural land due to the impact of soil erosion and urbanization around the lakes, Environment and Ecology Wing study report said.....

[Source: *Hueiyen News Service, Imphal, February 02, 2010*]

INVITATION FOR ARTICLE / RESEARCH PAPER

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- ☑ Related with local environmental issues;
- ☑ Full paper with abstract notes;
- ☑ About 650 to 700 words in English language;
- ☑ High resolution pictures (3-4 nos.) of the topic;

Note : Publication of the research paper / article will be decided by the editorial board of the Newsletter.

For submission & details

Editor

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... know your Wetlands

Wetlands are important, and sometimes essential, for the health, welfare and safety of people who live in or near them. They are amongst the world's most productive environments and provide a wide array of benefits.

Functions of Wetlands :

➤ The interactions of physical, biological and chemical components of a wetland, such as soils, water, plants and animals, enable the wetland to perform many vital functions, for example:

- water storage;
- storm protection and flood mitigation;
- shoreline stabilization and erosion control;
- groundwater recharge;
- groundwater discharge;
- water purification;
- retention of nutrients;
- retention of sediments;
- retention of pollutants;
- stabilization of local climate conditions, particularly rainfall and temperature.

Values of Wetlands :

Wetlands frequently provide tremendous economic benefits, for example:

- water supply (quantity and quality);
- fisheries (over two thirds of the world's fish harvest is linked to the health of wetland areas);
- agriculture, through the maintenance of water tables and nutrient retention in floodplains;
- timber and other building materials;
- energy resources, such as peat and plant matter;
- wildlife resources;
- transport;
- a wide range of other wetland products, including herbal medicines;
- recreation and tourism opportunities.

For further information, please contact
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