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Arsenic in Bengal Delta

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Abstract : *The problem of arsenic (As) poisoning in the upper deltaic plain of the Ganga-Bhagirathi River system in Bengal Basin of West Bengal, India is an alarming issue. Four blocks (Kaliachak – 1, 2, 3 and English Bazar) of Malda district, West Bengal were critically studied. As-content of more than 700 tube well water samples covering an area of 500 sq km and 11 no of surface water (river and pond) samples was measured by E-Merck Arsenic kit in the field with some laboratory replications. Parameters like pH, Eh, DO, Specific conductivity, salinity, depth of tube well water and year of installation of the wells were measured on the spots. A borehole of 60 m depth was drilled; sediment samples of the aquifers were collected to study the As-content separately in bulk samples as well as in clay fractions. A total of 17 no of different types of fertilizer and pesticide extensively used in the area were chemically analyzed.*

From this study, it is observed that maximum as content beyond permissible limit (0.05 mg/l) occurs within a depth range of 10-30 m with a non-linear distribution pattern. From the analysis of variance, it is found that block effect is highly significant in As distribution pattern. Mean arsenic level of Kaliachak block-1 is 0.2253 mg/l followed by Kaliachak-2 with arsenic level 0.1923, Kaliachak-3 with arsenic level 0.1755 and English Bazar with arsenic level 0.1324. The arsenious belt lies mainly within the Older terrace (T). The very recent flood plain deposits of silvery white, fine sands lying very close to the Ganga River margin do not contain significant amount of As. Elevated As concentration in the ground water was observed in alluvial sands, grayish white to brownish in colour, occurring away from the Ganga margin. Arsenic content of ground water in the same locality within a radius of ~ 20m varies within wide limits. Thus, it poses problem to delineate its distribution pattern. Such a patchy occurrence could not be explained satisfactorily by geomorphology. Results of X-ray analysis as well as SEM study of the aquifer and surface soil samples do not show any arsenic bearing minerals. This poses problem to link up its genesis to geology. Chemical analysis of surface soils indicates As value up to 4.5 ppm whereas chemical analysis of water as well as field kit measurement data show maximum As concentration 0.8mg/l. Interestingly, As content of surface water (pond and river) ranges up to 0.3 mg/l at some localities. This may be due to some anthropogenic input or biogenic influx that needs further study. Similarly, chemical analysis of aquifer clay samples of the borehole cores shows a maximum As content of up to 3 ppm whereas, the bulk samples (sand - clay mixture) of the cores contain a maximum of 17 ppm As value. Therefore, it is not always convincing that clay contains elevated As value. Chemical analysis of fertilizers and pesticides show As value < 2ppm except in one sample where it is 9 ppm. Hence the putative link of As to fertilizer and pesticides can be ruled out.

Finally, the results of SEM study probably enlighten the scenario of arsenic genesis and its mobilization process to some extent. Some microbe like features were noted in the aquifer sediments where there was

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elevated As concentration (17 ppm). It is likely that these microbes respire on As present in soil and aquifer sediments as background value. When they die, the As-content of their tissues is dissolved and mobilized to groundwater in appropriate redox condition. Moreover, microbes may proliferate in swampy area, marshy land, cut off channel/abandoned channel, stagnant water body where the geomorphic set-up plays some role. Hence a detailed study is needed on the role of metal reducing bacteria in the genesis of as and its mobilization processes.

Key Words: *Arsenic, Upper deltaic plain, Ganga-Bhagirathi river system, Bengal Basin.*

Downstream Variation in Bed Sediment Size and Sorting Along Dwarakeswar River in West Bengal, India

Debasis Ghosh*, **Sujay Bandyopadhyay**** **Monali Banerjee*****
and Mrinal Mandal****

Abstract : *Grain size is a fundamental attribute of sediment that helps to classify sedimentary environment and explain transport dynamics. The variation in grain size distribution and sorting process are mainly controlled by various factors such as flow regimes, boundary roughness, geomorphic process, petrological characteristics of source materials, mobility condition and rate of weathering of deposited materials on terrace and bar. Therefore, grain size distributions were examined at reach, bar and bed-form scales along the Dwarakeswar river in West Bengal. The work was carried out using satellite imageries, DEM and the data obtained was further ground checked for validation. Sediment samples have been collected from alluvial bar sequences and further supplemented by Total Station Survey and GPS mapping. The analytical results indicate that the influences of both natural and anthropogenic activity are jointly accountable for the asymmetrical sediment environment of Dwarakeswar river basin.*

Key Words: *fluvial bed sediment; downstream fining; sediment supply*

Flood Hazard Analysis and Damage Assessment with reference to Jalpaiguri District, West Bengal, India

Moitrayee Das*

Abstract : *Flood is the most common and natural phenomena of any flood prone region and damage is also very common event related to flood hazard of any magnitude. Impact of flood in any particular area is always concerned with the damage created by the flood. Flood Damage Impact Assessment (FIA) is a technique to assess flood impact in flood prone regions. It helps to quantify and understand how much of a given society will compromise with damage and which extent of the said society accepts the flood, as event or as hazard, such that flood can be viewed either as flood threshold limit or as flood hazard. The threshold limits to predict or indicate how far the society will take flood as an event with its corresponding damages. Jalpaiguri is a district of West Bengal which in 2014 has been divided in two districts namely Jalpaiguri and Alipurduar and in this paper the undivided Jalpaiguri District has been considered. This district has faced flood almost every year, which causes severe damage. However, the intensity of damage varies from year to year. Analysis of the actual amount of damage over human property and environment loss is too hard. To assess the present paper has analysed the flood damage of the district, the flood impact assessment (FIA) and has assessed the original hazardous condition of the district in past 43 years.*

Key Words: *threshold limit, flood impact, flood damage, damage assessment.*

Assessment of Environmental Degradation through Land Use / Land Cover Change Detection Using Remote Sensing and GIS in Durgapur City and its Surroundings

Suman Chatterjee* and Kaniska Sarkar**

Abstract : *Environmental degradation is a serious problem nowadays especially for the emerging cities and urban areas. Land use land cover change detection is one of the established approaches among several direct and indirect approaches to detect and analyse environmental degradation. With satellite imagery and GIS change detection has become easier than the past and also it is the most robust technique in present days for change detection. This Paper aims to assess the environmental degradation of Durgapur city and its surroundings through land use land cover (LULC) change detection using post classification comparison and few indices i.e. SAVI and MNDWI since 1987-2017. Special emphasis has been given to the degradation of vegetation, water bodies, expansion of mines and waste lands and built up areas throughout this period as well as basic mitigation measures.*

Key Words: *environmental degradation, remote sensing and GIS, LU/LC change detection, SAVI, MNDWI.*

Evolving Jainism: A Study on its Geography of Diffusion

Premangshu Chakrabarty*

Abstract : *Jainism has initially emerged in the eastern part of India about 800 years before the birth of Christ. From the present geographical distribution of Jain places of pilgrimage, a peculiar concentration is found in southern states, particularly in Karnataka, followed by Western states like Rajasthan and Gujarat. Jainism becomes almost extinct leaving behind only a few followers and sacred places in Eastern India. This paper is an attempt to study the nature of diffusion of Jainism from its place of origin with special reference to the distributional aspects of Jain shrines as manifestation of a historio-cultural process over space.*

Key Words: *tradition, pilgrimage, sacred, extinct, space*

Socio-Economic Profile of Slums in Barddhaman Municipality

Mahamaya Laha*

Abstract : *A slum is a heavily populated urban informal settlement characterized by substandard housing, poverty and high unemployment. In a class-I town Barddhaman of East Barddhaman district in West Bengal there are 141 slums sharing 29 per cent of the municipality population (2011). However there is variation in socio-economic development across the slums of this municipality as found from a case study of three selected slums of wards no. 1, 13 and 35. Of them the slum at ward No. 13 is mainly composed of East Bengali refugee who came and settled first in non- permanent slum houses and poor East Bengali people who once had a better economic condition and used to live outside slum in a permanent house then .Ward 1 slum is settled by Santhal tribes and Muslims and ward 35 slum by Santhal tribes and East Bengali refugees. The literacy rate, sanitation, housing and economic conditions are better and hazards are less in East Bengali people dominated slum of ward 13 than two other slums at wards 1 and 35.*

Key Words: *slum, social composition, sanitation, drinking water, housing condition*