THE BANGLADESH OBSERVER

Bioclimatological Changes In Bangladesh

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IN the course of earlier works some changes have been detected in the climatology of Barisal zone where a continental climate prevails in recent dry seasons in place of its long known maritime one of earlier days. This change in Barisal zone has been attributed to the recent higher temperature range, a characteristic feature of continental climate, in addition to an altered wind movement and rainfall pattern because of reduced water mass in the Meghna estuary. This change in and near the estuary, the prominent route of water cycle of the region, has been identified to be the cause of recent decreased rainfall in the region leading to recurring drought and aridity here. Present studies on bioclimatology dealing with water budget for life processes, provide further evidence of this change. Some more natural and artificial phenomena such as, rapid siltation and destruction of vegetation, cover of silted areas by biotic agencies have been noted recently to create more and more exposed land mass in the estuarine zone taking advantage of its currently occurring water reduction which involves a loss of the useful inland maritime climate of the country.

WATER BUDGET AND MOISTURE INDEX STUDIES

The various methods by which vegetation-climate of the world has been classified were given by Misra and Puri (1954) The water budgets are estimated by various authors, such as Snedaker (1977) and Tosi (described in Holdridge, 1972). It was shown that the plant-climate classification of Indo-Bangladesh region by the Thornthwaite's (1948) method seems to be the best (Puri, 1960). Thornthwaite developed an approach paying attention to the role of moisture stored in the soil and the energy relations involved both in evaporation and transpiration, e.g. evapotranspiration. As actual values of evapotranspiration cannot be developed easily, the standard adopted for it was the determination of the potential evapotranspiration or moisture need which is the value that would be attained from a surface covered with vegetation if moisture remained in adequate supply. The value of the potential evapotranspiration is estimated by Thornthwaite from mean temperature and day length (or latitude), the latter being a measure of radiation. Knowing the potential evapotranspiration and rainfall, it is possible to work out geographically and statistically the moisture available for recharging the soil month by month and the amount that will be withdrawn, so that each wet month will show a surplus (s), and a dry month a deficiency (d) of water needed for evapotranspiration. Annual values for s, d and potential evapotranspiration can be obtained as totals of the months by figure and a moisture index (Im) calculated from the empirical formula of Thornthwaite given below: Im— 100s-God Im—Water need Following this, moist climates that are generally favourable for most life processes show positive values of Im and dry climates negative ones. The sub-types of this bioclimatology have a distinct moisture index given in Tables 1 and 2. These sub-types resemble Thornthwaite's earlier classification with the difference that the present scheme is more rational (Subrahmanyam., 1955; Puri, 1960)

Table 1 Classification of climatic types in relation to water budget.

Climate type	Moisture index
A Perhumid	100 and above
B_4 Humid	80 to 99
B_3 Humid	60 to 79
B_2 Humid	40 to 59
B_1 Humid	20 to 39
C_2 Moist sub humid	1 to19
C_1 Dry sub-humid	—20 to 0
D Semi-arid	—40 to 19
E Arid	—60 to 39

Table 2, A comparison of salient features of water budget for some stations.

Stations	Period	Water need (mm)	Water surplus (mm)	Water deficit (mm)	Moisture index
Satkhira	1931-60	1524.1	536.1	617.6	10.8
Satkhira	1961-76	1496.7	437.7	308.0	16.8
Khulna	1931-60	1549.8	510.5	507.6	13.2
Khulna	1961-76	1574.1	661.1	518.8	22.2
Barisal	1931-60	1543.4	988.7	498.8	44.6
Barisal	1961-76	1514.9	774.0	492.7	31.5

DISCUSSION

A comparative study of moisture indices of Satkhira, Khulna and Barisal given in Table 2 reveals that Satkhira and Barisal in recent years behave in a distinctly opposite manner, in the former, a large reduction of both water surplus and water deficit indicates clearly the reduction of water there in the wet season and an increase of it in dry season. This phenomenon increases thereby the moisture index value of Satkhira from a lower figure of 10.8 to a higher one of 16.8 as opposed to the condition prevailing at Barisal where there is a sharp decrease of it (moisture index). Khulna too, as reported earlier (loc. cit.) behaves in a manner more or less similar to that of Satkhira showing an increase of moisture index value there. The climatic type of these two stations (Khulna and Satkhira, the stations far away from the Meghna estuary) practically remains the same, i.e. C2 moist sub-humid or close to its next higher moisture types of B_1 humid shown in Table 1 and 2. The behaviour of Barisal, the station in the vicinity of the Meghna estuary, however, is very significantly noteworthy because of its recent tendency of desertification shown by a substantial reduction of the moisture index from its earlier higher value of 44.6 to its recent lower one of 31.5 (Table-2) altering distinctly its climatic type from the moist B_2 humid to drier B_1 humid. This recent behaviour of Barisal in having a drier climatic condition of continental nature in place of its earlier maritime one (resulting from influences of the then more expansive maritime Meghna estuary) as discussed in the Regional Seminar on the Disaster Preparedness held in Dacca in December, 1979, is thus further substantiated by the present study.

It is further to be noted here that because of recent reduction of Meghna estuary water extensive land masses have appeared to create a continental climatic condition there to adversely affect the normal funnelling process of water vapour towards the north reported earlier (loc. cit.). The vegetation cover which is well known for its temperature range controlling ability (cf. Daubenmire 1959) to mitigate these adversities, cannot flourish under the currently prevailing circumstances in the estuarine zone where the people often remove the tops of widely grown natural tall grasses for thatching and other house contruction purposes. These deep rooted tall grasses with their poor shade-casting ability cannot be easily removed for growing better plant species because of high expenditure involved. Again, because of occasional and uncertain erosion people often avoid taking care of these new land masses. Curiously enough, the dispute regarding the ownership of these land masses and frequent theft and dacoities occurring there often discourage people's effort to vegetate the lands aggravating further the unfavourable climatic condition noted above.

Another notable feature of these new land formations in the estuary is the danger for birds life, such as ducks. From these new lands the hunters can approach the birds easily to disturb them too much. It is probably for this reason a very large number of wild ducks are noted recently to take their daytime shelter in the well protected big dug tank of Durgasagor Dighi in spite of its location in the densely populated area of the Barisal district.