*3.4 Geo-accumulation index (Igeo)*

The criterion to evaluate the metal pollution in sediments is the *Igeo* that has been widely used since the late 1960s which is calculated by Eq (X) shown in Table X. In the present study, Igeo for the elements Cr, Ni, Cu, As, Cd and Pb is measured and presented in Table 3. Calculated Igeo values for both seasons showed that Cd and Pb have the maximum geo-accumulation index having positive values in all five rivers. In Shitalakshya and Buriganga the Igeo values of Cd revealed strongly to extremely pollution in both season having the values of 4.74 being highest and 4.16 in winter season and in rainy season the values were 4.39 and 3.88 respectively. In Turag, Dhaleshwari and Balu the Igeo values of Cd in winter season were 3.08, 2.43 and 2.06 indicating strongly to moderately strong pollution and in rainy season the values were 2.63, 1.88 and 1.74 ranging in (2-3) moderate to strong pollution and (1-2) moderate pollution. The Igeo values of Pb in Buriganga, Turag and Shitalakshya were 3.21, 2.96, 2.39 in winter season ranging in (3-4) strongly polluted and (2-3) moderate to strong polluted and in rainy season the values were 2.47, 2.02 and 1.58 respectively indicating (2-3) moderate to strong pollution and (1-2) moderate pollution. In Dhaleshwari and Balu the Igeo values of Pb in winter were 1.34 and 1.05 indicating moderate pollution respectively where it was (0-1) unpolluted to moderate polluted in rainy season having the values of 0.45 and 0.17 respectively. In Buriganga the Igeo values of Cu in winter and rainy season were 1.67 and 1.10 respectively indicating moderate pollution. In Dhaleshwari and Balu the Igeo values of Pb in winter and rainy season, As in winter season in Shitalakshya, Cu in Shitalakshya and Turag in rainy season and all five rivers in winter season lied between (0-1) indicating unpolluted to moderately polluted. All the other HMs of Cr, Ni, Cu, As have the negative values of Igeo indicating no pollution in rainy and winter season by such heavy metals. Rakib et al. (2021a) also found Igeo for Ti, Fe, Cu, Rb, Sr, Zr, Pb and Zn in the sediments beloged to class zero, indicating the sediments in Hatiya, Chairman Ghat, and ship-breaking yards along the marine coast of Sitakundo were unpolluted by these HMs.

Table 3: Geoaccumulation index (*Igeo*) of HMs for sediments of Balu, Buriganga, Dhaleshwari, Shitalakshya and Turag River, Bangladesh

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Season | River | Cr | Ni | Cu | As | Cd | Pb |
| Winter | Balu | -3.18 | -1.68 | 0.2 | -1.29 | 2.06 | 1.05 |
| Buriganga | -0.36 | -0.44 | 1.67 | -0.84 | 4.16 | 3.21 |
| Dhaleshwari | -0.52 | -1.52 | 0.5 | -0.08 | 2.43 | 1.34 |
| Shitalakshya | -1.02 | -0.98 | 0.91 | 0.09 | 4.74 | 2.39 |
| Turag | -3.06 | -0.47 | 0.59 | -0.35 | 3.08 | 2.96 |
| Rainy | Balu | -3.77 | -2 | -0.29 | -1.52 | 1.74 | 0.17 |
| Buriganga | -0.75 | -0.95 | 1.1 | -1.13 | 3.88 | 2.47 |
| Dhaleshwari | -0.95 | -2.29 | -0.1 | -0.49 | 1.88 | 0.45 |
| Shitalakshya | -1.57 | -1.59 | 0.29 | -0.37 | 4.39 | 1.58 |
| Turag | -3.37 | -1.27 | 0.25 | -0.56 | 2.63 | 2.02 |
| Maximum  (*Mmax*) |  | -0.36 | -0.44 | 1.67 | 0.09 | 4.74 | 3.21 |
| Minimum  (*Mmin*) |  | -3.77 | -2.29 | -0.29 | -1.52 | 1.74 | 0.17 |
| Mean (N=10) |  | -1.86 | -1.32 | 0.51 | -0.65 | 3.1 | 1.76 |