**Figure S1. Representative ATR-FTIR spectra of MPs in surface sediments**



**Figure S2. Representative Raman spectra of MPs in surface sediments**

**Figure S3. Seasonal variation of MP polymer composition in Chennai beach sediments**

**Figure S4. EDS spectra of MPs in surface sediments along the Chennai collected during SW monsoon**



**Figure S5. EDS spectra of MPs in surface sediments along the Chennai collected during NE monsoon**

**HD Model.tif**

**Figure S6. Simulation of circulation pattern during flood (a) and ebb (b) tide during the SW monsoon, 2019; flood (c) and ebb (d) tidal pattern during the NE monsoon, 2020**

**Table S1. The details of sampling locations with geographical co-ordinates**

|  |  |  |  |
| --- | --- | --- | --- |
| **Beach** | **Sample ID** | **Latitude (N)** | **Longitude (E)** |
| Ennore | LT | 13°13'24.30" | 80°19'42.03" |
| HT | 13°13'24.46" | 80°19'41.73" |
| Berm line | 13°13'24.33" | 80°19'41.44" |
| Cooum | LT | 13° 3'58.85" | 80°17'23.05" |
| HT | 13° 3'58.73" | 80°17'22.54" |
| Berm line | 13° 3'58.48" | 80°17'22.07" |
| Marina | LT | 13° 2'22.45" | 80°16'54.20" |
| HT | 13° 2'22.46" | 80°16'54.00" |
| Berm line | 13° 2'22.46" | 80°16'53.82" |
| Adyar | LT | 13° 1'0.35" | 80°16'41.29" |
| HT | 13° 1'0.36" | 80°16'41.17" |
| Berm line | 13° 1'0.38" | 80°16'41.08" |
| Thiruvanmiyur | LT | 12°59'9.49" | 80°16'11.46" |
| HT | 12°59'9.57" | 80°16'11.24" |
| Berm line | 12°59'9.64" | 80°16'11.08" |
| Neelankarai | LT | 12°56'57.19" | 80°15'43.00" |
| HT | 12°56'57.27" | 80°15'42.76" |
| Berm line | 12°56'57.39" | 80°15'42.49" |

**Table S2. Terminology used to describe the risk level criteria for MP pollution**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PHI | Risk category | PLI | Risk category | PERI | Degree of contamination |
| <10 | I | <10 | I | <150 | Minor |
| 10–100 | II | 10–20 | II | 150 – 600 | High |
| 100–1000 | III | 20–30 | III | 600 – 1220 | Danger |
| >1000 | IV | >30 | IV | > 1220 | Extreme danger |