

Numerical analysis of marine litter at Chennai Marina beach, Tamilnadu

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Abstract

This study was undertaken to evaluate numerically during the study period at Marina beach, Chennai, Tamilnadu. Surveys were conducted from 2010 to 2011. The sources of litter were classified by land based and ocean based origin. Marine litter was analysed by season wise and year wise. The results indicated that significant increase in pre monsoon (summer) season over the study period. Probably, population growth, fishing activity, tourism activity contributed major role for highly distribution during summer. Finally the study was concluded that land based sources were dominant compared to ocean based sources.

KEYWORDS: Marine litter, Sources, Beach, Ocean, season, numerical analysis.

Introduction

Marine litter has been defined as solid materials of human origin that are discarded at sea or reach the sea through waterways of domestic and industrial outfalls (National Academy of Sciences, 1975). Marine debris, defined as any manufactured or processed solid material that enters the marine environment, is a greatly underestimated component of marine pollution. 'Item that appearing on beaches or at sea as a result of human activity' (Marine Conservation Society (MCS), 2004). Although there are various types of debris, plastics (synthetic organic polymers) make up most of the marine litter worldwide (Derraik, 2002); Coe and Rogers, 1997);

Marine litter is generated due to the activities like refreshments, fishing, recreation, industrial activities etc. Widely varying composition is due to different activities that take place along the coast. It also varies in quantity and quality in the space and time domains.

Methodology

Study area

Marina Beach, Chennai area (including promenade) covers an area 0.702 sq.km. within geographic coordinates of latitude 13°03' 44"N, longitude 80°16' 53"E and latitude 13°02' 24"N, longitude 80°16' 52"E . Marina beach has multiple sources for marine litter. Both land based and ocean based litter are commonly found in this beach. There are two major rivers viz., Koovam on the north and Adyar on the south of the beach; both of which debouch the land based litter to the ocean. It has the highest number of tourists from all over the country and the world.

Sampling method

The stations were surveyed for marine litter during winter, pre monsoon,

monsoon and post monsoon in 2010 to 2011. To evaluate the amount of litter on the beach quantitatively, 10 metre by 10 metre survey units (100m²) were continuously set from the water's edge to the backshore zone of beach. Ten points per beach were locked depending on the geography of the beaches using GPS (It is desirable, particularly in relocating and determining the sampling unit). In each unit, the items were sorted in categories according to the type of material (cloth, glass/ceramic, metal, paper, plastic, rubber, wood and other) and possible usage (beverage related, food packaging, general packaging, recreational, fisheries related, ropes, domestic/ household related, construction materials, medical utensils, foams/sponges, smoking related, clothing, aerosols and pumps for foams, miscellaneous and unidentified). Finally, they were counted and weighed on site. Finally, the data collected from field were transferred for calculations with descriptive statistics.

Results and Discussion

Sources

During the study period of 2010 – 2011, a total of 5710 pieces of litter were collected in Marina beach. Out of which, 87% was considered to have a land-based source (LBS) and 13% belongs to ocean-based source (OBS). The litter are classified based on their source of origin and disposal site.

Figure 1.1 illustrates the count distribution of land-based and ocean-based marine litter during the sampling period 2010 – 2011 at Marina beach,

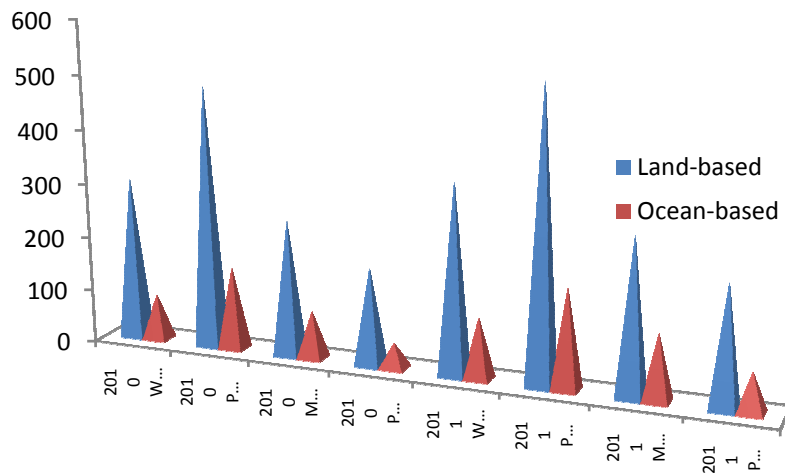


Fig 1.1 Source wise marine litter distribution, Marina beach

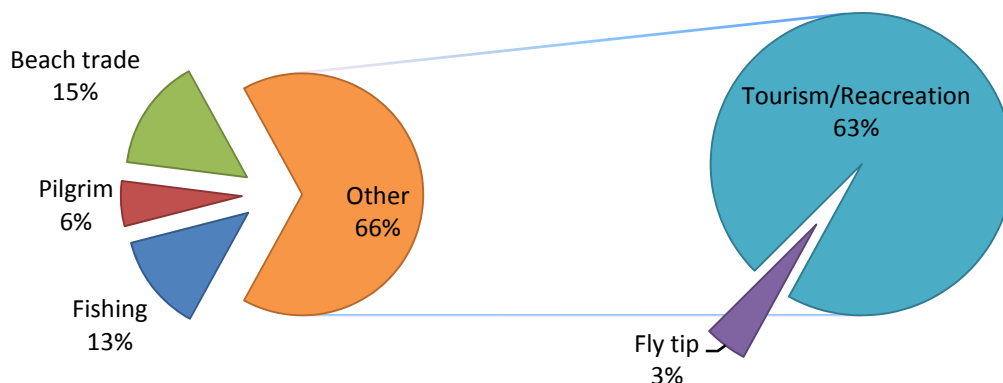


Fig . 1.2 Percentage of routes of marine litter in Marina beach

Chennai. The main routes of beach litter in Marina Beach were public litter (dropped by visitors on the beach), beach trade, fishing litter, pilgrim and fly tipped. The above diagram (Fig. 1.2) illustrates the percentage of possible routes of marine litter in marina beach during 2010 -2011.

In between the study tenure, totally 13% of litter count at Marina fall under fishing category. High accumulations were spotted in the North of study area. Around 15% of the total litter is found to be routed through beach trade. Marina beach is well known tourist beach; hence debris due to tourism and recreational activities account for 63% of total litter.

According to GESAMP, 1991, land based sources account for up to 80 percent of the world's marine pollution. This study of coastal litter at Marina beach also depicts a total of 63% of land based sources.

Quantitative analysis

The total number of litter items were 385. The highest reported items were Plastic 100 (26.0%), Paper 97 (25.2%) and Cloth 52 (13.5%) and the lowest items were Glass and ceramics 27 (7.0%) Metal 26 (6.8%), Rubber 25 (6.5%) Wood 39, (10.1%), Other 19 (4.9%) respectively. During 2010 Pre monsoon, totaling 635, found in the 2010 pre monsoon season litter items with distributions of plastic - 152 (23.9%), paper - 114 (18.0%), cloth - 98 (15.4%), rubber - 69 (10.9%), other - 67 (10.6%), least count is on wood - 51 (8.0%), glass and ceramics - 45 (7.1%) and metal - 39 (6.1%) respectively.

Totally during 2010 Monsoon, there were 337 pieces of 8 litter items at marina during 2010 monsoon season. Among which plastic = 72 (21.4%), cloth = 53 (15.7%), paper = 52 (15.4%), glass and ceramics = 41 (12.2%), rubber = 36 (10.7%), metal= 32 (9.5%), other = 27 (8.0%), wood = 24 (7.1%) During the 2010 Post monsoon season Marina, the highly distributed items at Marina were plastic with counts of 52 (24.5%), followed by paper=46 (20.4%), Cloth=31 (13.8%); Rubber = 28 (12.4%); Wood= 21 (9.3%); Glass and ceramics =19 (8.4%); Other = 15 (6.7%); Metal= 13 (5.8%). In total, there were 225 items as reported. Quantitative appraisal of marine litter during 2011 of marina winter reveals a total of 460 pieces of 8 litter items with plastic at 111 (24.1%), paper at 79 (17.2%), cloth at 69 (15.0%), rubber at 52 (11.3%), wood at 45 (9.8%), glass and ceramics at 39 (8.5%), metal at 39 (8.5%), other at 26 (5.7%). Total 715 of counts recorded during 2011 the highest reported item is plastic with 165 pieces (24.5.1%), paper = 135 (18.9%), cloth = 119 (16.6%), other = 85 (11.9%), wood = 69

(9.7%), rubber = 62 (8.7%), glass and ceramics = 41 (5.7%), metal = 39 (5.5%). During 2011 monsoon count of marine litter as 413. The highest found item was cloth at 86 (20.8%); plastic at 79 (19.1%); paper 61 (14.8%); metal at 42 (10.2%); rubber at 41 (9.9%); glass and ceramics at 39 (9.4%); wood at 39 (9.4%), other at 26 (6.3%). The total count of the litter occurs in 292 at marina in 2011 post monsoon. Distribution of different litter items in descending order is as follows: plastic = 55 (18.8%); paper = 49 (16.8%); cloth = 42 (14.4%); wood = 37 (12.7%); rubber = 36 (12.3%); glass and ceramics = 27 (9.2%); metal = 26 (8.9%); and other = 20 (6.8%).

During all season wise and year wise count data showed that plastic and paper were highly distributed at marina beach.

Conclusion

Under numerical analysis, sources as to fishing (ocean based), pilgrim, fly tipped, beach trade and tourism (land based), quantitative aspects are discussed. Land based sources dominate in beach study. From this numerical analysis showed Marina beach suffer from littering through Tourism/ recreation. Studies of this sort, when reaches people will bring in awareness to keep beaches clean and there will be a welcome attitudinal change in their behaviour with regard to disposal of wastes.

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