OPTIMUM UTILIZATION OF URBAN MUNICIPAL SOLID WASTE TO PROMOTE SUSTAINABLE ENVIRONMENT BY USING REMOTE SENSING AND GIS APPLICATIONS

Engineering

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ABSTRACT

Solid waste is the most influencing parameter in the day to day life of human existence on the earth as the quantity that is generating per capita per day is increasing significantly year by year along with the improved life style which becomes more problematic issue in the days to come if it is not handled properly. Earlier environment used to focus with respect to the pollution like air pollution and water pollution where majority of the people used encounter but now a day's in the urban areas solid waste disposal without any consequences on the environment is a challenging issue to concern administrative authorities why because even to provide shelter along with basic needs like water, clean air etc is a burden to them in addition to them the solid waste becomes highly considerable issue by keeping view of development of the area, that is why in all most all the areas of the world especially in urban areas where the population has been increasing at an rapid uncontrollable number it is imposing heavy burden to find out suitable solution for dealing with solid waste

Rapid industrialization is one of the major issue to be considered as part of solid waste at one side the industrialization is highly mandatory and most important domain for the development of any country but at the other side it attracts large number of people to migrate from their living areas in the name of employment to urban areas which is the high priority issue with respect to the generation of per capita solid waste from their daily day to day activities that leads to undesirable consequences on environment if they are not handled properly. At most of the cities and the towns it is being observed that the solid waste is dumping at the outskirts without proper treatment which leads to other inevitable issues especially during rainy season the chemicals from the leachate of the waste percolated into the groundwater aquifers and makes the problem more severe.

It is observing that from different studies almost 80 percent of the solid waste can be recycled by adopting suitable and sophisticated methodology. In this study we have selected four municipalities comes under capital region of newly formed Andhra Pradesh waste we have collected the solid waste and segregated all recyclable waste materials than analyzed organic waste materials and proposed an effective methodology for optimum utilization of organic wastes for the welfare of the society and also to the environment.

KEYWORDS

1. INTRODUCTION

It has been observing that the availability of land resources are reducing year by year in the existed scenario of development activities prevailing around the world which leads dangerous consequences for the existence of human race in the days to come, one of the prime reason for reducing land resources is conversion of land to meet various needs of the public among them allocation of suitable land for dumping and processing of solid waste is high priority issue. While selecting site quantity and intensity of waste must be considered why because the intensity of waste materials is vary and depends on the people standards of living, existed climatic conditions along with the socio economic conditions prevailed in the respective areas. Planning and executing of municipal solid waste management depends on the quantity of waste that is generating at different capacities like per day and per week. Most of the countries around the world are following open dumping method for eliminating waste materials from the urban areas due to its economical feasibility as well as no requirement of technical expertise to dump the wastes but it is not at all suggestible for long period of time as the waste materials may become threat to the environment as well as to the underground aquifers. In order to overcome the problems associated with solid waste an immediate and effective strategy has to be developed right from the source of generation to all the stages of solid waste management where the solid waste has to be segregated based on the characteristics of the waste materials at the dumping site after the collection after the segregation all the recyclable waste materials like plastic, paper glass etc., will be sent for recycling and the remaining organic waste will be treated effectively. In this study after the segregation of collected solid waste we have studied and analyzed organic waste materials by evaluating their intensity with the parameters like P^H , TDS, Alkalinity, Chlorides, Cadmium, Chromium, Copper, Arsenic and Iron as a pilot study to promote an effective methodology on handling of urban solid waste in view of promoting urban environment sustainability.

2. DESCRIPTION OF THE STUDY AREA

For this study we have selected four municipalities by name Vijayawada Municipal corporation (VMC), Mangalagiri Municipal

corporation (MMC), Guntur Municipal corporation (GMC) and Tenali Municipal Corporation (TMC) comes under the jurisdictions of APCRDA (Andhra Pradesh Capital Region Development authorities. Where the three municipalities comes under guntur district except vijayawada municipal Corporation which comes under krishna district of Andhra Pradesh. After the announcement of new capital region for the bifurcated Andhra Pradesh it was noticed that huge migration of the people to capital region of Andhra Pradesh as part of employment as well as for the quality of life which in turn leads to impose burden on local administrative bodies for providing basic facilities like supply of water, electricity along with the management of solid waste, by keeping this in view this study area was selected to promote safe urban environmental sustainability with respect to municipal solid waste.

Fig 1: Location map of the study area

3. OBJECTIVES OF THE STUDY

The main objectives this study is

- Physico chemico analysis of organic municipal solid waste segregated from the collected four municipality dumping yards by name Vijayawada Municipal corporation (VMC), Manglagiri Municipal corporation (MMC), Guntur Municipal corporation (GMC) and Tenali Municipal Corporation (TMC).
- Preparation of GIS maps for the analysis of solid waste
- Recommending action plan for the effective management of organic municipal solid waste to promote safe urban environmental quality with respect to solid waste.

4. METHODOLOGY

- Thematic maps preparation with the help of satellite data and SOI topo sheets

- The data of PAN and LISS-III will be corrected geometrically by PCA method and then imagery of satellite will be printed in FCC in 1:50,000 scale.
- Elements of visual interpretation technique were adopted to update the prepared thematic maps
- Quality check was done for all the prepared maps to incorporate corrections if any
- Filed observations were considered to finalize the maps along with the quality check
- Final copy was prepared with A4 size lay out.
- Solid waste samples were analyzed by adopting respective parameter standard procedures.
- GIS maps were prepared for solid waste analysis

Fig 2: Flow chart of the study

5. ANALYSIS AND RESULTS OF THE SOLID WASTE SAMPLES:

The collected waste were segregated and sent all recyclable waste materials for recycling and then the remaining degradable organic waste was mixed with suitable quantity of water as per the standards to prepare soil sample then the tests were conducted by adopting standard analytical procedures of respective parameters for three times in a series of raw

solid waste followed by adding of earthworms to the waste and then lastly by adding kitchen refuses to the vermicular organic solid waste with a time gap of two weeks of storage for every stage.

5.1 Analysis of raw solid waste sample:

The collected samples were segregated and processed for analysis the results were shown in the below table

Table1 Analysis of raw solid waste sample

Name/ Parameter	P ^H	TDS	TS	Alkalinity	Chlorides as mg/l	Cadmium as mg/l	Chromium as / mg/l	Copper as mg/l	Arsenic as mg/l	Iron as mg/l
VMC	12.7	150	489	176	201	0.0047	2.22	1.83	1.18	1.61
MMC	13.1	195	496	187	215	0.0032	1.97	1.77	1.24	1.73
GMC	11.2	190	492	180	205	0.0043	2.05	1.78	1.27	1.82
TMC	10.5	198	494	182	210	0.0025	1.94	1.61	1.22	1.68

5.2 Analysis of raw solid waste after addition of earthworms (Vermin Composting):

The solid waste was mixed with suitable quantity of earthworms and stored for two weeks then analyzed to find out the intensity of solid waste

Table 2: Analysis of vermin composting.

Name/ Parameter	PH	TDS	TS	Alkalinity	Chlorides as mg/l	Cadmium as mg/l	Chromium as mg/l	Copper as mg/l	Arsenic as mg/l	Iron as mg/l
VMC	11.4	131	456	151	169	0.0034	2.1	1.7	1.03	1.42
MMC	12.5	184	460	160	183	0.003	1.76	1.66	0.99	1.36
GMC	10.3	175	451	155	175	0.0035	1.86	1.62	1.15	1.54
TMC	9.6	180	455	152	180	0.002	1.73	1.54	1.07	1.29

5.3 Analysis of raw solid waste after addition of earthworms and Kitchen refuses:

The solid waste of earthworms mixed with suitable quantity of kitchen refuses and stored for two weeks then analyzed to find out the intensity of solid waste

Table 3: Analysis of raw solid waste after addition of earthworms and Kitchen refuses

Name/ Parameter	PH	TDS	TS	Alkalinity	Chlorides as mg/l	Cadmium as mg/l	Chromium as mg/l	Copper as mg/l	Arsenic as mg/l	Iron as mg/l
VMC	10.3	122	431	133	148	0.003	1.88	1.44	0.92	1.02
MMC	10.5	179	442	142	160	0.002	1.57	1.32	0.79	1.08
GMC	9.5	171	440	141	152	0.003	1.52	1.28	0.98	1.15
TMC	8.4	175	434	140	154	0.002	1.54	1.37	0.87	0.99

6. GIS MAPS FOR SOLID WASTE ANALYSIS:

Figure 3 Location of dumping yards at study area

Figure 4: Physico-chemical analysis of raw solid waste

Figure 5: Physico-chemical analyses of vermin composting

Figure 6: Physico-chemical analyses of solid waste after addition of earthworms and kitchen refuses

7. Conclusions:

- The present study reveals about the nature of solid waste at respective municipalities
- In the analysis part it was confirmed that there is a reduction of pollutant intensity of solid waste when compared with all parameter values of raw solid waste analysis and the analysis after the addition of earth worms.
- It is also noted that there is reduction of pollutant concentration when the vermin composting is added with the kitchen refuses.
- By considering the study it is confirmed that when the solid waste

is treating with with earthworms and kitchen refuses the intensity of waste materials will be reduced in such a way the same can be utilized by farmers as a natural manure to improve the soil fertility at one side and the other side this process also reduces the problems associated with land scarcity for dumping and storage of solid waste in urban areas.

- GIS maps are the best tools to project the information of waste intensity and can be stored for the future reference to monitor the periodical changes.

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