

Report of the waste audit conducted at KIS with recommendations

I. Waste audit at collection points

A solid waste audit was conducted at all 23 collection points in KIS main campus. The number of bins for different categories and quantity of waste in respective bins were estimated. Since waste is collected once in three days, per day waste quantities have been calculated accordingly after minimizing the barrel weight. Kitchen food waste is excluded but packaging waste was included. The audit result is given in Table 1.

Table 1. Result of the waste audit at KIS main campus

Sl. No	Collection Points	Categories, No. of bins placed and waste quantities at Main Campus								
		Food		Paper		Recyclables		Trash		Total waste (Kg)
		No. of Bins	Kg.	No. of Bins	Kg.	No. of Bins	Kg.	No. of Bins	Kg.	
1	Kennady Dorm							1	6	6
2	Upper Dorm							1	3.5	3.5
3	Lower Dorm							1	3	3
4	Middle school (I)					1	2	2	4.5	6.5
5	Middle school (II)					1	2	1	6	8
6	Dispensary	1	4.5					1	4	8.5
7	Soluik Dorm					1	6	3	2	9
8	Science Block (I)							3	2	2
9	Science Block (II)					1	2	1	2	4
10	Library			1	1	1	2.5	1	2	5.5
11	Computer lab	1	1.5							1.5
12	Music Block					1	1	1	2	3
13	Airly					1	2	2	4	6
14	Phelps Dorm					2	5	1	5	10
15	Wissi Dorm					1	2	2	4	6
16	Lake View					1	2	3	4	6
17	Art Studio							1	4	4
18	Powel cottage							2	2	2
19	Car parking					1	4	3	6	10
20	Tennis covered court					1	0.5	3	2	2.5
21	Kennady Dorm (II)							1	7	7
22	Gymkhana					1	1.5	4	9.5	11
23	Alumni hall			1	0.5	1	1	1	3	5.5
22	Class room			1	2	1	1	1	4	7
23	Kitchen (packaging waste)									17
	TOTAL	2	6	3	3.5	16	34.5	40	91.5	154.5

From the table, it can be seen that the infrastructure is good, but design is bad in the following ways.

1. Among the total 61 bins installed for waste disposal, there are 40 bins labelled 'trash' i.e. about 2/3rd of the total waste bins of the school are allotted for mixed waste. This high allocation for 'trash' bins is encouraging the mixed waste disposal culture but neither source segregation nor resource recovery.
2. From the audit, it was found that 91.5 kg out of total 154.5 kg of dry waste generated daily at campus belong to the bins labelled 'trash'. This means, 60% of the dry waste generated at KIS is being directly taken to the dumpyard for disposal without any resource recovery (which confirms the above point). The saddest part is that about 60-70% of this landfilled waste is potentially recyclable if properly segregated in the first place (photo 1).
3. From the field observation and discussion with generators, it seems depositing waste in 'trash' bin is easy and saves from the pain of deciding whether the waste is recyclable or not. Sometimes the depositor simply didn't know whether the material is recyclable and eventually it is put in the 'trash' bin. In this manner, a lot of recyclables are ending up in 'trash' bin.
4. At many locations, there are only 'trash' bins present which make it impossible for a generator genuinely interested in source segregation to dispose his waste in segregated manner.
5. There is no food waste bin in residential units like staff quarters and student dormitories where a lot of food waste is generated. Especially in student dormitories, a lot of left-over food items, snacks and fruit peelings/skin have been observed which were being disposed in the 'trash' and 'recyclables' bins. Placing a separate food waste bin can solve this problem.
6. At some places, both paper and recyclables bins are provided which creates confusion.
7. At present, the bin labels are not clearly conveying what should go to the respective bins. It has been left as a waste depositor's dilemma to choose the right category to deposit. Neither the operational staff has correct idea of segregating according to the bin labels except for paper, cardboard and bottles.

Recommendations:

1. The present labelling system should be changed. The barrels should be relabelled as paper, plastic, food waste and others. The label 'Trash' should be removed and substituted with 'Others/ Miscellaneous'.
2. In girls dormitories, bins labelled sanitary pads (in toilets) and in staff quarters, bins labelled 'broken glass' and 'unbroken glass' should be kept along with above-mentioned category bins. In dorms, it's advised to keep bins for food waste and for cardboard in addition to 'paper' since good turnover of food waste and cardboard (from online purchases) have been noticed.
3. All labels should accompany pictorial representation to make it clear for the depositor in which bin the waste should be correctly deposited. If the above mentioned re-labelling is acceptable to KIS administration, **I can design appropriate pictorial labels for the waste bins of KIS.**
4. From the waste stream analysis, I could gain an understanding on the basic composition, generation rate and most frequently encountered materials at certain collection points of KIS. The different categories of barrels should be distributed accordingly. KIS already has 61 barrels, which can be redistributed to meet this requirement. If the above mentioned categorization is acceptable, I can recommend how many bins, bin capacities and what categories of bins should be allotted at each collection point.

5. Where the quantity of waste generated is less and the waste is dry in nature, for example at class rooms area, cardboard or carton boxes can be provided to dispose the wastes.
6. There should be well depicted posters at key areas to remind students and staff to dispose their wastes in the correct category of bins.

II. Food Waste Audit at the Kitchen and Dining of KIS

Table 2. Food-waste quantities in kg at main Kitchen and dining

Audit Days/Date	Breakfast			Lunch			Dinner			Total		
	PRC	POC	PKW	PRC	POC	PKW	PRC	POC	PKW	PRC	POC	PKW
Mar-28	7	21.5	7	13	112	4	18	77	7.5	38	210.5	18.5
Mar-29	9	24	4	11	81	4	12	42	5	33	147	13
Mar-30	6	23.5	6	10	84	4.5	11	47	4	27	154.5	14.5
Mar-31	11	17	6	15	65	7	15	100	6	41	182	19
Apr-03	9	18	5	20	126	10	24	57	4	53	201	19
Average	8.4	20.8	5.6	13.8	93.6	5.9	16	64.6	5.3	38.4	179	16.8

PRC – Pre Consumer Waste; POC – Post consumer Waste; PKW – Packaging Waste

An average 217.4 kg of food waste (179 + 38.4) is wasted daily at Kitchen and Dining. Packaging waste was separated and added to the campus waste audit of previous session. This is more than half kilogram of food waste per person which is far above than national averages.

I've noticed that some categories cannot be avoided and add up to the weight, like meat bones, fruit peelings etc. But still, cooked unconsumed food has been wasted in large quantities. **So I recommend to divert such consumable food to the operational staff on a come and take basis after the mess hour.**

III. Secondary Sorting facility

Without secondary sorting no recyclables will actually get recycled since intermediate recycling agents and recycling industries prefer neatly sorted, uniform type of material to be bought. Secondary sorting is the strength and gateway to material recovery. If taken Puducherry as an example, EcoService in Auroville is running successfully due to the strong secondary sorting facility they have in place. In case of Shuddham NGO though they had good secondary sorting facility and achieved some resource recovery, due to extensive influx of mixed waste(primary segregation), it couldn't function on full scale. So I'm of the opinion that if there is a system for source segregation with waste generators and workers willing to participate in it, they ought to have a strong secondary sorting facility for the materials to actually get recovered. It is also the key to reduce the landfill load considerably.

At present at KIS, the secondary sorting is available for cardboard, neat paper and to small extent PET bottles/tins. A vast majority of recyclable plastics with recycling facility in accessible distance are being landfilled directly.

I recommend

1. To merge both teams of waste collection (trash team and recyclables team) and work as a single work force/team.

2. Employment of two secondary sorting staff regularly at the secondary sorting shed. If the secondary sorting can happen good, the transportation frequency to dumpyard can be brought down to twice a week. In that case, the saved fuel money and load workers' wages can be saved to pay the sorting staff. Alternately, the two loading-unloading assistants for the dumpyard truck can be full-time employed for secondary-sorting and weekly twice loading-unloading of remaining landfill waste.
3. The students should not secondarily sort the waste. Their role should be limited to source segregation.
4. Secondary sorting facility should be established under my supervision since I need to train them to identify the subcategories of materials and proper handling of waste.
5. I've noticed that Secondary storage facility is already available at the sorting area. If it can be used to the full, small quantities of some dry waste categories can be stored for long term until they build up in quantity preferred by the recycler and can be sold.