**Analyzing Sikkim’s Waste Management Trends (2016-2024)**

1. **Introduction**

**1.1. Data Compilation**

Extract yearly data for each Urban Local Body (ULB) from the reports for the following categories:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **ULBs (Population)** | **Waste Generated (TPD)** | **Waste Collected (TPD)** | **Waste Processing (TPD)** | **Waste Landfilled (TPD)** | **Eff (%)** | **Landfill Dep (%)** | **Processing Focus (%)** | **Per Capita Waste (kg/day)** |
| 2016-17 | GMC (P1), GyMC (P2), MNP (P3), NMC (P4), RNP (P5), SNP (P6), JMC (P7) | A1, A2, A3, A4, A5, A6, A7 | B1, B2, B3, B4, B5, B6, B7 | C1, C2, C3, C4, C5, C6, C7 | D1, D2, D3, D4, D5, D6, D7 | ((C+D)/A)×100 | (D/A)×100 | (C/A)×100 | (A×1000)/P |
| 2017-18 | GMC (P8), GyMC (P9), MNP (P10), NMC (P11), RNP (P12), SNP (P13), JMC (P14) | E1, E2, E3, E4, E5, E6, E7 | F1, F2, F3, F4, F5, F6, F7 | G1, G2, G3, G4, G5, G6, G7 | H1, H2, H3, H4, H5, H6, H7 | ((G+H)/E)×100 | (H/E)×100 | (G/E)×100 | (E×1000)/P |
| 2018-19 | GMC (P15), GyMC (P16), MNP (P17), NMC (P18), RNP (P19), SNP (P20), JMC (P21) | I1, I2, I3, I4, I5, I6, I7 | J1, J2, J3, J4, J5, J6, J7 | K1, K2, K3, K4, K5, K6, K7 | L1, L2, L3, L4, L5, L6, L7 | ((K+L)/I)×100 | (L/I)×100 | (K/I)×100 | (I×1000)/P |
| ...for all yeas | ... for all yeas | ... for all yeas | ... | ... for all yeas | ... for all yeas | ... for all yeas | ... for all yeas | ... for all yeas | ... for all yeas |
| 2023-24 | GMC (P56), GyMC (P57), MNP (P58), NMC (P59), RNP (P60), SNP (P61), JMC (P62) | CC1, CC2, CC3, CC4, CC5, CC6, CC7 | DD1, DD2, DD3, DD4, DD5, DD6, DD7 | EE1, EE2, EE3, EE4, EE5, EE6, EE7 | FF1, FF2, FF3, FF4, FF5, FF6, FF7 | ((EE+FF)/CC)×100 | (FF/CC)×100 | (EE/CC)×100 | (CC×1000)/P |

**A table with numbers and symbols

AI-generated content may be incorrect.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year ( for total Sikkim)** | **Waste Generated (TPD)** | **Waste Collected (TPD)** | **Waste Processed (TPD)** | **Waste Landfilled (TPD)** | **Growth Rate (%)** | **Efficiency (%)** | **Per Capita Waste (kg/day)** | **Landfill Dependency (%)** | **Processing Focus (%)** | **Collection-Processing Gap (TPD)** |
| 2016-17 | **A** | **B** | **C** | **D** | - | ((C+D)/A)×100 | (A×1000)/Pop | (D/A)×100 | (C/A)×100 | B - (C+D) |
| 2017-18 | **E** | **F** | **G** | **H** | ((E-A)/A)×100 | ((G+H)/E)×100 | (E×1000)/Pop | (H/E)×100 | (G/E)×100 | F - (G+H) |
| 2018-19 | **I** | **J** | **K** | **L** | ((I-E)/E)×100 | ((K+L)/I)×100 | (I×1000)/Pop | (L/I)×100 | (K/I)×100 | J - (K+L) |
| 2019-20 | **M** | **N** | **O** | **P** | ((M-I)/I)×100 | ((O+P)/M)×100 | (M×1000)/Pop | (P/M)×100 | (O/M)×100 | N - (O+P) |
| 2020-21 | **Q** | **R** | **S** | **T** | ((Q-M)/M)×100 | ((S+T)/Q)×100 | (Q×1000)/Pop | (T/Q)×100 | (S/Q)×100 | R - (S+T) |
| 2021-22 | **U** | **V** | **W** | **X** | ((U-Q)/Q)×100 | ((W+X)/U)×100 | (U×1000)/Pop | (X/U)×100 | (W/U)×100 | V - (W+X) |
| 2022-23 | **Y** | **Z** | **AA** | **BB** | ((Y-U)/U)×100 | ((AA+BB)/Y)×100 | (Y×1000)/Pop | (BB/Y)×100 | (AA/Y)×100 | Z - (AA+BB) |
| 2023-24 | **CC** | **DD** | **EE** | **FF** | ((CC-Y)/Y)×100 | ((EE+FF)/CC)×100 | (CC×1000)/Pop | (FF/CC)×100 | (EE/CC)×100 | DD - (EE+FF) |

### **Explanation of Notations:**

* **A, E, I, M, Q, U, Y, CC** → Waste Generated (TPD) for each year.
* **B, F, J, N, R, V, Z, DD** → Waste Collected (TPD).
* **C, G, K, O, S, W, AA, EE** → Waste Processed (TPD).
* **D, H, L, P, T, X, BB, FF** → Waste Landfilled (TPD)

## 2. Methodology for Data Processing and Analysis ( for year 2023-24 ONLY and for total state )

### 2.1 Waste Management Efficiency (%)

* This metric measures the proportion of total waste that is either processed or safely landfilled.
* Formula: Efficiency (%) = ((Processed Waste + Landfilled Waste) / Total Waste Generated) × 100

### 2.2 Per Capita Waste Generation (kg/day)

* This metric assesses the average amount of waste generated per person per day.
* Formula: Per Capita Waste = (Waste Generated (TPD) × 1000) / Population

### 2.3 Landfill Dependency vs. Processing Focus (%)

* Formula for Landfill Dependency: Landfill Dependency (%) = (Waste Landfilled / Total Waste Generated) × 100
* Formula for Processing Focus: Processing Focus (%) = (Waste Processed / Total Waste Generated) × 100

### 2.4 Collection-Processing Gap (TPD)

* This metric measures the difference between waste collected and the sum of waste processed and landfilled.
* Formula: Collection-Processing Gap = Waste Collected - (Waste Processed + Waste Landfilled)

1. **Result**

Unmanaged Waste (TPD) = Waste generated - (Waste Processed + Waste Landfilled)

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Place (for 2023-24)** | **Waste Generated (TPD)** | **Waste Collected (TPD)** | **Waste Processed (TPD)** | **Waste Landfilled (TPD)** | **Unmanaged Waste (TPD)** | **Efficiency (%)** | **Per Capita Waste (kg/day)** | **Landfill Dependency (%)** | **Processing Focus (%)** | **Collection-Processing Gap (TPD)** |
| GMC |  |  |  |  |  |  |  |  |  |  |
| GyMC |  |  |  |  |  |  |  |  |  |  |
| MNP |  |  |  |  |  |  |  |  |  |  |
| NMC |  |  |  |  |  |  |  |  |  |  |
| RNP |  |  |  |  |  |  |  |  |  |  |
| SNP |  |  |  |  |  |  |  |  |  |  |
| JMC |  |  |  |  |  |  |  |  |  |  |
| Total |  |  |  |  |  |  |  |  |  |  |

1. **Discussion**