

2020 Asia–Pacific Statistics Week

A decade of action for the 2030 Agenda: Statistics that leaves no one and nowhere behind

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Waste Inventory Report - baseline data for Sustainable Development Goals (SDGs) and National Key Result Areas (NKRAs)

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Abstract: Knowing the quantity and the composition of waste is one of the initial steps in designing and delivering a sound system for waste management in the country. Bhutan's 12th Five-Year Development Plan (FYP 2019-2023) emphasizes effective waste management at the national level as one of the key performance indicators (KPI). The waste related statistics is also one of the key indicators in SDG 11 "Sustainable Cities and Communities" and 12 "Responsible Consumption and Production".

While developing the SDG dash board in the country, it was learned that there is no officially published statistics related to waste. The National Statistics Bureau (NSB) in collaboration with National Environment Commission (NECS) conducted first ever national level waste inventory survey in November - December 2019. It is mainly to provide the baseline data for the SDG 11 and 12 as well as for the FYP's National Key Result Areas (NKRAs).

The survey covered almost all the waste generating sectors such as Households, Commercial Units, Institutes, Health Centers, Industries, Government Offices and vegetable markets. While covering all sectors, all the waste focal persons from different sectors were engaged right from conception of the project. The data users from various sectors were engaged in developing the questionnaires related to their sector, framing manuals, developing methodologies to conduct the survey and also during the field enumeration to assist the enumerators and supervisors.

The data users were involved mainly to improve the data quality, draw interest and appreciate the statistics produced by the NSB and other data producers to enhance the coordination between data producers and data users. The NECS being the main environmental data user were also involved in finding the financial support for the survey and also involved throughout the survey process to understand the survey proceedings and gain trust in statistics. The survey adopted the "Guidelines for solid waste management assessment (baseline survey) in secondary cities and small towns in Asia and the Pacific" developed by UNESCAP.

The survey finding shows Bhutan is generating 172.15 Metric Tons of waste daily which comes per capita waste generation of 0.23 kilogram per day. Like any other developing countries, more than 50 percent of the wastes comes from households and almost 50 percent of the total wastes constitutes food waste. The results are presented separately for different sectors. Using the same data, the NSB is planning to collaborate with UNESCAP to come up with the preliminary Waste Account report following the System of Environmental Economic Accounting (SEEA).

Keywords: <Coordination>; <Trust>; <Collaboration>; <Developing Countries>; <Waste Account>

i. Introduction:

Waste management is one of the prevailing governance challenges that have multi-fold implications on environmental, economic and social dimensions. Like most developing countries, there has been rapid population growth and urbanization leading to an increasing volume of waste generation. This posed challenges in providing adequate and efficient waste management services. Waste management over the past year has received increased impetus with the observation of Zero Waste Hour on the second day of every month across the country with the aim to inculcate a behavioral change towards proper waste management and practice sustainable consumption lifestyle leading to a safe, healthy and clean community environment.

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The Constitution of the Kingdom of Bhutan provides constitutional right to every Bhutanese as a trustee of the Kingdom's natural resources and environment for the benefit of the present and future generations. Article 5.1 of the Constitution empowers every citizen with fundamental duty to protect the natural environment, conservation of the rich biodiversity and prevention of all forms of ecological degradation including noise, visual and physical pollution through the adoption and support of environment friendly practices and policies.

Bhutan's 12th Five-Year Development Plan (2019-2023) emphasizes effective waste management at the national level as one of the key performance indicators (KPI). It sets out clear performance indicators to be measured by the absolute amount of solid waste (in tons) recycled at the national level. It envisages to measure the efficiency of municipality services through the percentage of urban population that are satisfied with the effectiveness and efficiency of waste collection services.

The 2030 agenda for sustainable development (SDGs) adopted by United Nation Member States in 2015 gives utmost importance to the Environmental dimensions. The waste related indicators in the SDG targets such as Target 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and **municipal and other waste management**. Target 12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses. Target 12.4 By 2030, achieve the environmentally sound **management of chemicals and all wastes** throughout their life cycle in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment are concrete evidences for the need of more and more waste related statistics.

Whilst there has been increased attention and focus on the waste, there is a paucity of information relating to waste. It is in light of this that the NSB, NECS with the support of the WWF have commissioned the survey on waste inventory which is the first of its kind ever undertaken in our country. The study was conducted to fill the data gaps in waste related statistics both for SDGs and NKRA's to support the evidence based decision making in Environmental fields. The study covered all the waste generating sectors such as Households, Commercial Units, Industries, Institutes and Health Centers. The study adopted the guidelines developed by UNESCAP and followed two-staged methods. In the first stage, the enumerators administered the perception questionnaires for the sampling units. The perception questionnaires comprised of the current daily practices of waste management, awareness and knowledge in waste management, issues and challenges faced while managing waste and the suggestions and feedbacks to improve the waste management system in the country. In the second stage, the enumerators collected the wastes from the sampling units to study the total waste generation and composition of the waste. For the households, the survey collected wastes generated for seven days while for other sectors, it was for two days only.

ii. **Methodology:**

As in all censuses and surveys, survey methodology and operation standards were strictly followed and complied with to assure the quality of the survey results. Contrary to the other household surveys, the study followed two staged procedures. In the first stage the sample units were administered with perception questionnaire and in the second the same units were requested to store their waste for the measurement and composition study.

The preparation of the survey entailed designing of questionnaire, consultation with stakeholders, development of survey module in the Survey Solution system and selection and training of field

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enumerators. On successful completion of the preparatory works of the survey, the field enumeration was conducted in November and December 2019. Being the first nation-wide survey on waste to be ever conducted by the NSB, several rounds of workshops were conducted at various stages of the survey preparatory phase. The perception questionnaires and survey methodologies were discussed with relevant stakeholders at different levels.

In drafting the perception questionnaire, several survey questions of the other countries that conducted similar surveys were thoroughly reviewed as there were no national experiences to draw on. Different versions of the questionnaire were drafted, based on the recommendations and feedback from the stakeholders' workshops. Six different perception questionnaires were developed to different sectors. Following the finalization of all different questionnaires, field manuals were developed to guide the enumerators and supervisors during the enumeration. These manuals also provided the basis for the enumerator and supervisor training prior to the enumeration. The pilot survey was conducted to check the consistencies and the flow of the questionnaires before conducting training to the field enumerators and supervisors.

For the perception questionnaire, Survey Solution has been used to create the interface for data capture. While, for the quantification of the waste, the waste quantity data were recorded in the excel (hardcopy) by the enumerators after collecting and measuring the waste from different sectors. The waste quantity recorded in the excel format has been later entered in CSPRO software and then exported to STATA for analysis.

The guidelines for solid waste management assessment (baseline survey) produced by UNESCAP was adopted to collect and measure the wastes from sampling units and study the waste composition by different waste contributing sectors. The process involved are as follows:

The selected sampling units (Households, Commercial units, Institutes, Health centers, Industries and Private waste companies) were first administered the perception questionnaires by the enumerators; Subsequently, the units were provided with the plastic bags to store the waste generated; The households were asked to store the daily waste generated for a period of one week (seven days) while establishments/units were asked to store two days' waste (as they generate substantial amount of waste); The collection days were agreed with the respondents and their waste was collected based on the agreed schedule; and This was followed by weighing waste by different composition and recording the weight in the data sheets developed for waste quantification.

A stratified three-stage sampling design was adopted to collect information on household's waste generation. A total of seven dzongkhags, two each from eastern and central regions and three from western region were selected applying Probability Proportional to Size with Replacement (PPSWR) with number of households as size of variable. The Probability Proportional to Size with Replacement (PPSWR) was also adopted to select EA and Chiwog in the selected Dzongkhags and then the households are selected applying Circular Systematic Sampling (CSS). Accordingly, the survey weight has been allocated to generalize the survey findings to the whole population in the country. The quota sampling technique which is non-probabilistic version of stratified sampling was adopted to select sampling units for commercial establishment units, industries, medical facilities, schools, colleges and training institutes.

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The survey enumeration was conducted for 36 days by 40 enumerators and 10 supervisors. After the data collection was completed, the consolidated dataset undergoes a thorough checking exercise to identify missing values, errors and inconsistencies and responses that did not meet established criteria for plausibility. Data checking and editing was conducted from December 2019 to January 2020. In many cases, issues were followed up through telephone calls with the respondents to resolve the problems.

iii. Result:

The survey result showed that the total solid waste generated in the country was 172,153.75 kilograms per day. The per capita solid waste generation was estimated to be 0.23 kg per day. Of the total, more than 85 percent of the wastes was from the households and commercial units and the least was from health centers as presented in the Figure 1.

Figure 1: Proportion of wastes from different sectors in percentage

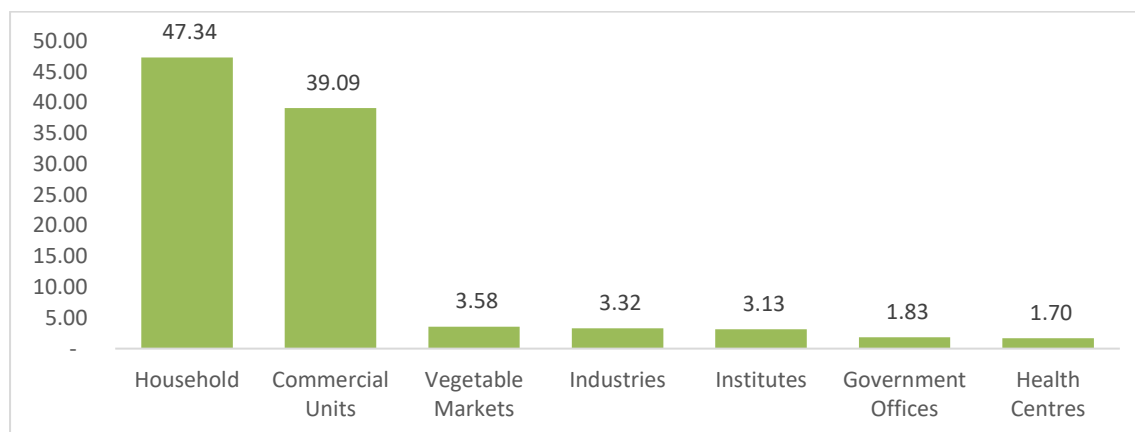
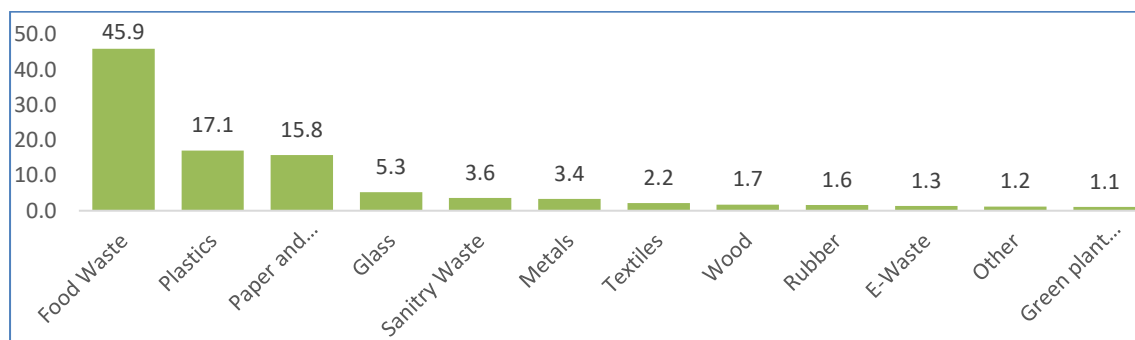


Figure 2 illustrates the composition of wastes generated from various sources in percent. Of the total waste generation of 172.16 metric tons, approximately 50 percent comprises food waste; it includes all the waste generated from kitchen such as vegetables, fruits, food remains, etc. The Plastics (soft plastics, pet bottles & HDPE) comes in second with 17.1 percent followed by paper and card boards (15.8%).

Figure 2: Waste composition in percentage



Households: The households generated more than 80,000 kilograms of solid waste every day. On an average, each household generated around 0.5 kilograms of solid waste in a day. The waste generated by urban households (0.7 kg per day per household) is almost double the amount of waste generated by

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rural households (0.4 kg per day per household). In the urban households, food waste constitutes almost 60 percent of the total waste while in the rural households, the proportion of food waste is comparably lower at 40 percent. Both in urban and rural households, the plastics and paper and paper boards come next after the food waste. Of the total households, more than 60 percent of the households had access to the waste collection services in the country. However, when compared between urban and rural households, more than 75 percent of the urban households had access to collection service against the 15 percent of the rural households.

Commercial Units: The commercial units include all retail/whole sale shops, hotels, restaurant and bar, hardware and electronic shops, repairing services, small scale manufacturing units, etc. On an average, each commercial unit generates 5.03 kilograms of waste in a day. The total waste generated by the commercial units in a day is estimated at 67,299.67 kilograms. More than one-third (35%) of the total waste generated by commercial units constitutes of food waste, followed by plastic waste (17.7%) and paper and card boards (12.8%). More than 75 percent of the commercial units reported to have knowledge on 3Rs of waste management while, only around 50 percent reported that they practice the 3Rs. The commercial units reported their willingness to pay a monthly fee of about Nu.230 for the waste collection service.

Industries: The survey collected solid general waste generated from the industries excluding the toxic and hazardous wastes. The waste generation from industries is estimated at 5,719 kilograms daily which comes to an average of 16.16 kilograms of waste per industry per day. Around 40 percent of the industry waste comprises of paper related products and cardboards, followed by food waste (23%) and plastics (13.5%). They also generate rubbers, glass, metals, woods and other wastes. Some of the issues faced by the industries in waste management are cited as lack of waste storage facility, no proper disposal sites, lack of collection services, etc. Majority of the industries reported that they were aware of the relevant sections in the environmental acts and regulations.

Institutes: Institutes include schools, colleges, training centers and government offices. In total, institutes generate around 8,472 kilograms of wastes a day. Food waste constitutes 38 percent of the total institute waste, paper and cardboards constitutes 25 percent and plastic constitutes 21 percent. Remaining wastes in the institutes are textiles, metals, sanitary waste, glass and others. Some of the waste management issues faced by the institutes in their institutional areas are littering, not having enough garbage disposal area, no municipal waste collection services, etc.

Health Centers: For the health centers, only the general wastes were collected whereas, the medical waste was obtained from the administrative record. The health centers collectively generate 1,984.34 kilograms of wastes in a day. One-third of the total wastes generated from the health centers comprises of food waste, followed by plastics (27%), paper and cardboards (25%) and less than five percent of textiles, sanitary, glass, rubber and other wastes. Some of the methods used by health centers to dispose their waste were open burning, dumping in pit, using collection services, etc.

Vegetable Markets: The total wastes generated by vegetable vendors across the country was estimated at 6,168.5 kilograms a day. Of total waste generation, more than 70 percent constitutes food waste, followed by paper and cardboards (12.7%), plastics (7%). The vegetable vendors also generate small proportion of sanitary, textiles and other wastes.

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Private Waste Companies: The total amount of wastes collected by private waste companies in a week is 437.36 metric tons. Of which, 28 percent were wet waste, 31 percent were recyclable wastes and 40 percent were non-recyclable wastes. Lack of support from the government, shortage of labour owing to dignity of labour, lack of fund and awareness on waste management, etc. were some of the issues faced by the private waste management companies.

iv. Discussion, Conclusion and Recommendations:

The first ever national level waste inventory survey shows that more than 80 percent of the total wastes are generated by households and the commercial units in the country. Almost 50 percent of the total wastes constitutes food waste indicating the potential for composting. The plastic and paper related waste constitutes 33 percent of total wastes indicating the potential of recycling or reusing the wastes. Most of the respondents are aware of segregating waste and have knowledge on 3Rs (Reduce, Reuse and Recycle) of waste management, importance of waste management and also the rules and acts related to waste management in the country. It was also learned that more than 75 percent of the households reported that it is usually female member in the household managing the waste. Using the same data, the National Statistical Bureau in collaboration with UNESCAP will come up with the preliminary Waste Account in the country. Based on the survey outputs and other assessments, following recommendations have been identified as generally applicable to achieving sustainable waste management in Bhutan: Building systematic, more reliable and comprehensive waste-related statics to gauge countries NKRA and SDGs; Strictly implementing the existing waste related rules and acts by the relevant authorities; Provide more education and awareness on importance of waste management for the societies; Encouraging entrepreneurship and innovative business in waste management activities by injecting funds from government in the initial stage to boost the private investors; Wherever feasible, the regular waste collection service and proper waste disposal facilities shall be provided for general public to encourage them to practice waste segregation at source and minimize illegal dumping and burning; and Promote awareness and capacity building for general public to practice composting and 3Rs of waste management.

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