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# BASELINE ASSESSMENT OF CURRENT SCENARIO OF PLASTIC WASTE MANAGEMENT ISLAMABAD CAPITAL TERRITORY (ICT) AND AYUBIA NATIONAL PARK (ANP)

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# BASELINE ASSESSMENT OF CURRENT SCENARIO OF PLASTIC WASTE MANAGEMENT ISLAMABAD CAPITAL TERRITORY (ICT) AND AYUBIA NATIONAL PARK (ANP)

Conducted by
WWF-Pakistan
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# FOREWORD

Vibeke Jensen, Representative/Director
UNESCO Islamabad

Plastic pollution has become one of the most pressing global environmental issues affecting terrestrial, coastal, marine and natural ecosystems. In Pakistan, the situation is very precarious due to lack of public awareness, resources and management capacity. Land and water-based pollution are posing threats to the local communities and biodiversity. The Indus River has been found to be one of the most polluted rivers in the world.

To address the situation Pakistan needs reliable statistics to understand how much plastic is produced, recycled and wasted in the country. The broader policies and regulations are available for plastic management but implementation is very weak, this is why actual facts and figures are needed to help put effective implementation in place.

Within the framework of the UNESCO's Programme 2018-19, UNESCO has contributed to a variety of initiatives on natural and water resource management in Pakistan. Among other things, UNESCO initiated this baseline study on plastic waste for Islamabad Capital Territory and Ayubia National Park. The study has been conducted by World Wide Fund for Nature-Pakistan. The study has covered all types of plastic waste in the two areas and has identified opportunities for future actions. The study also provides a framework for further similar studies of other cities in Pakistan.

# PREFACE

Hammad Naqi Khan, Director General, WWF-Pakistan

Complacency in addressing the negative externalities of plastic pollution has become endemic in our society. Part of the reason for this negligence is the immense convenience plastic products bring in everyday life. Plastic waste, especially in the developing world, is increasing at an exponential rate due to consumer driven behavior, lack of at-source waste separation, improper disposal and informal recycling of plastics.

The throw-away culture associated with plastic is exacerbated by its durability, making plastic a profoundly devastating problem for the world. This especially holds true for Pakistan, where mismanagement of plastic waste becomes a matter of social injustice causing public health problems for communities across all tiers of society.

In order to tackle plastic pollution, we must fully understand the predicament Pakistan finds itself in. Thus, a quantitative baseline study on the generation and management trends of plastic waste is needed to help establish the magnitude of the problem. In this regard, WWF has been a pioneer in establishing global best practices when it comes to dealing with environmental challenges. Hence, WWF-Pakistan has partnered with UNESCO to conduct a baseline study on plastic waste in Islamabad and Ayubia National Park. This will prove to be a vital first step in curbing Pakistan's plastic pollution.

# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ANP | Ayubia National Park |
| BHU | Basic Health Unit |
| CDA | Capital Development Authority |
| FGDs | Focus Group Discussions |
| GDA | Galliyat Development Authority |
| HDPE | High-Density Polyethylene |
| ICT | Islamabad Capital Territory |
| Kg | Kilogram |
| LDPE | Low-Density Polyethylene |
| MCI | Municipal Corporation of Islamabad |
| NGO | Non-Government Organization |
| PET | Polyethylene Terephthalate |
| PP | Polypropylene |
| PS | Polystyrene |
| PVC | Polyvinyl Chloride |
| PKR | Rupees |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNESCAP | United Nations Economic and Social Commission for Asia and the Pacific |
| WWF | World Wide Fund for Nature |

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Special gratitude is also extended to Mr. Ahsan Hamid (Media Officer, GDA) and Mr. Imran Khan (Media Supporter, GDA) for logistical support and help in establishment of key contacts in the ANP branch of the study. Lastly, appreciation is also due for the Lahore and Islamabad regional offices of WWF-Pakistan for their unwavering support in all phases of the baseline study.

# EXECUTIVE SUMMARY

While high-income countries face only the impacts of their own consumption, developing nations must endure the externalities of these developed economies.[1] Thus, the focus of the least developed part of the world must not be on reducing its relatively normal (or even low) consumption, but managing its surplus material flow. In this regard, it is the need of the hour that developing countries address the concerns revolving around post-consumer plastic waste.

This study is in line with the identified goal since it addresses the first step preceding the improvement of plastic waste handling in ICT and ANP - a baseline analysis of the quantity, characterization and the contemporary supply chain model of plastic waste. An integrated system of data collection was set in place to acquire the aforementioned; waste samples were assessed from various sites of urban ICT three times a week- twice during weekdays and once over the weekend. From rural ICT and ANP waste samples were assessed twice a week- once over the weekday and once over the weekend. Through the data acquired over the course of the study, it was ascertained that all major areas of ANP and ICT received a considerable amount of plastic waste, constituting the major plastic types. However, LDPE was the most commonly found plastic waste type in the waste streams of both ICT and ANP while PVC and Polystyrene were relatively less common. On the other hand, the informal waste sector, comprising of informal waste pickers, MCI workers and junk dealers mostly deal in PET and HDPE based post-consumer waste since they have a higher post-recycling value and are generally more profitable. This information was again verified by recyclers who attested to recycling PET and HDPE in large numbers. Apart from indicating the demand and supply chain cycle of post-consumer plastic waste prevalent throughout ICT and ANP, this finding also identified waste picking practices taking place in both regions.

Overall, it was found that 14.26% of waste generated in ICT and 48.56% of waste generated in ANP comprised of plastics. Based on the literature review and findings of the report post-consumer PET and HDPE were found to be the most prevalent plastic waste types in the recycling sector and are, hence, the most feasible options for any prospective recycling plant. It is imperative to address the current challenges and gaps that exist in the plastic waste supply chain in order to effectively streamline the process of plastic waste recovery and recycling; this includes the formal and informal waste sector as well as society at large.

[1] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=13&cad=rja&uact=8&ved=2ahUKEwim7o3g2bHlAhUcBWMBHe0UCGwQFjAMegQIAxAC&url=https%3A%2F%2Fwww.mdpi.com%2F2071-1050%2F10%2F5%2F1664%2Fpdf&usg=AOvVaw19lisDG3JQRfrE_EEndgD1

# INTRODUCTION

Figure 1: Heap of mix plastic waste

## Plastics have remained a menace ever since their production in the early 1900s.

**164,332**

**tons of plastic is found in the Indus River, which is the second most polluted river of the world, according to the UN Clean Seas.**

Due to the linear life cycle of plastics, the majority of them end up polluting water bodies and land. Arguably, one of the leading causes behind plastic pollution is the lack of baseline data on the types of plastics generated, collected, and the quantities in which they are recycled in Pakistan. While providing guidelines for solid waste management in 2005, the Pakistan Environmental Protection Agency concluded that plastic forms a considerable portion of solid waste that is generated in the country.[2]

Islamabad and other cities have an active informal sector and micro-enterprise recycling, reuse and repair systems, which have competitive recycling and recovery rates to stay in business.[3] Garbage, collected from door-to-door acquisition, includes about 20 to 30 per cent material that can be recycled and is recycled by scavengers.[4] According to information from the marketing chain, each shop has its own fixed number of hawkers who are commissioned to collect/purchase discarded material or junk on a

[2] http://www.environment.gov.pk/images/provincialsepasguidelines/SWMGLinesDraft.pdf
[3] https://www.unescap.org/sites/default/files/baseline%20survey_islamabad_finalised.pdf
[4] https://www.unescap.org/sites/default/files/baseline%20survey_islamabad_finalised.pdf

daily basis. These hawkers are part of an organized chain in the informal sector. The unorganized chain includes Afghan migrants, who sort and segregate waste in separate bags for the head who hires their services at cheap rates. These scavengers usually concentrate on collection of paper, plastic material, glass and ceramics, and metal pieces.

The general waste collection trend in large cities of Pakistan, such as Islamabad, is collection efficiencies ranging from zero per cent in low-income rural areas to 90 per cent in high-income areas. Moreover, current trends in demographics, when overlain with waste generation reveal that urban population growth is highly correlated with increased solid waste pollution.[5] Thus, it can be inferred that the waste collection gap, regardless of its actual figure, is rising concurrently with the population.[6] It is, therefore, pertinent to address the current process of handling post-consumer plastic waste in order to address this issue.

In light of the need identified, WWF-Pakistan in collaboration with UNESCO, has carried out a baseline study based on the following objectives:

* **Assessing and benchmarking the current scenario of plastic waste management (generation, collection, segregation and recycling) in the scope areas.**
* **Analyzing the feasibility of current post-consumer plastic recycling in the scope areas and enterprise options for stakeholders involved.**
* **Providing recommendations on feasible low cost eco-friendly products and/or other products developed from recycled plastics that can be produced on a mass scale.**

This baseline will act as an extension aid in developing solutions to improve and formalize the recovery and recycling of plastics. Additionally, by advocating and creating awareness at all levels through focused group discussions and consultative workshops, segregation at source and recycling of plastics will improve and pave a path for a circular plastic economy and create new avenues to transform waste into useful products. This report provides an insight into the plastic waste characterization of ICT and ANP, current collection trends as well as recycling practices identified through waste assessments, interviews and data analysis.

[5] http://www.environment.gov.pk/images/provincialsepasguidelines/SWMGLinesDraft.pdf;
[6] https://www.pide.org.pk/pdf/Working%20Paper/CEECC%20Working%20Paper-3.pdf

# METHODOLOGY


Figure 2: Flow chart representing the study methodology

## 2.1 FOCUS GROUP DICUSSION

Figure 3: Meeting with Capital Development Authority

A series of focus group discussions were held in different locations throughout ICT and ANP. In ICT the primary facilitator was CDA, represented by Mr. Iqtidar Ahmed, Assistant Director Sanitation. Numerous meetings were held in the directorate of sanitation office to identify and finalise scope sites as well as a course of action.

Similarly, meetings were also held with field supervisors/officers designated to each selected site in order to gauge and update their understanding of the task in hand and to also take suggestions from them to ensure a smooth period of waste assessment.

In ANP, meetings were held with the representative of the Galliyat Development Authority, Mr. Ahsan Hameed, Media Officer at his office in Abbottabad. Through these meetings, an execution plan for field visits, sampling and interviews was devised. Next, WWF's field officers met with the operations team of GDA to brief them about the course of action and also take suggestions from them to ensure an effective period of waste assessment.

Figure 4: Meeting with field supervisor Mr. Zain, Inspector, G-9

Similarly, meetings were also held with field supervisors/officers designated to each selected site in order to gauge and update their understanding of the task at hand and get recommendations to ensure a smooth period of waste assessment.

## 2.2 IDENTIFICATION OF SCOPE AREAS

### 2.2.1 Islamabad Capital Territory

In ICT, sites for surveys and waste assessment as well as participants, were chosen via judgment sampling, with the aim of covering the geographic spread of Islamabad and ensuring that all tiers of the social strata – high, mixed, medium and low income areas – are well-represented. Based on these prerequisites, both rural and urban areas of ICT were identified. Rural areas identified include: Saidpur, Banigala, Barakahu, Jagiot, Alipur, Nilore, Rawat, Mohri Khumbal and Sihala. While the urban areas identified include: B-17, E-7, F-11, F-7, F-10, G-6, G-7, G-9, G-10, G-11, H-8, I-9, I-8, and I-12.

**Each area represents and contains all stakeholders involved in the plastic supply chain, to guarantee a comprehensive output.**

## Table 1: Scope areas

| Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 |
|---|---|---|---|---|
| E-7<br>F-7, F-11, F-10<br>G-10, G-9, G-11, G-6<br>H-8<br>I-9, I-8, I-11, I-12<br>Bari Imam | B-17 | Saidpur, Bara Kahu and Bani Gala | Jagiot, Nilore and Ali Pur | Sihala, Rawat and Mohri Khumbal |

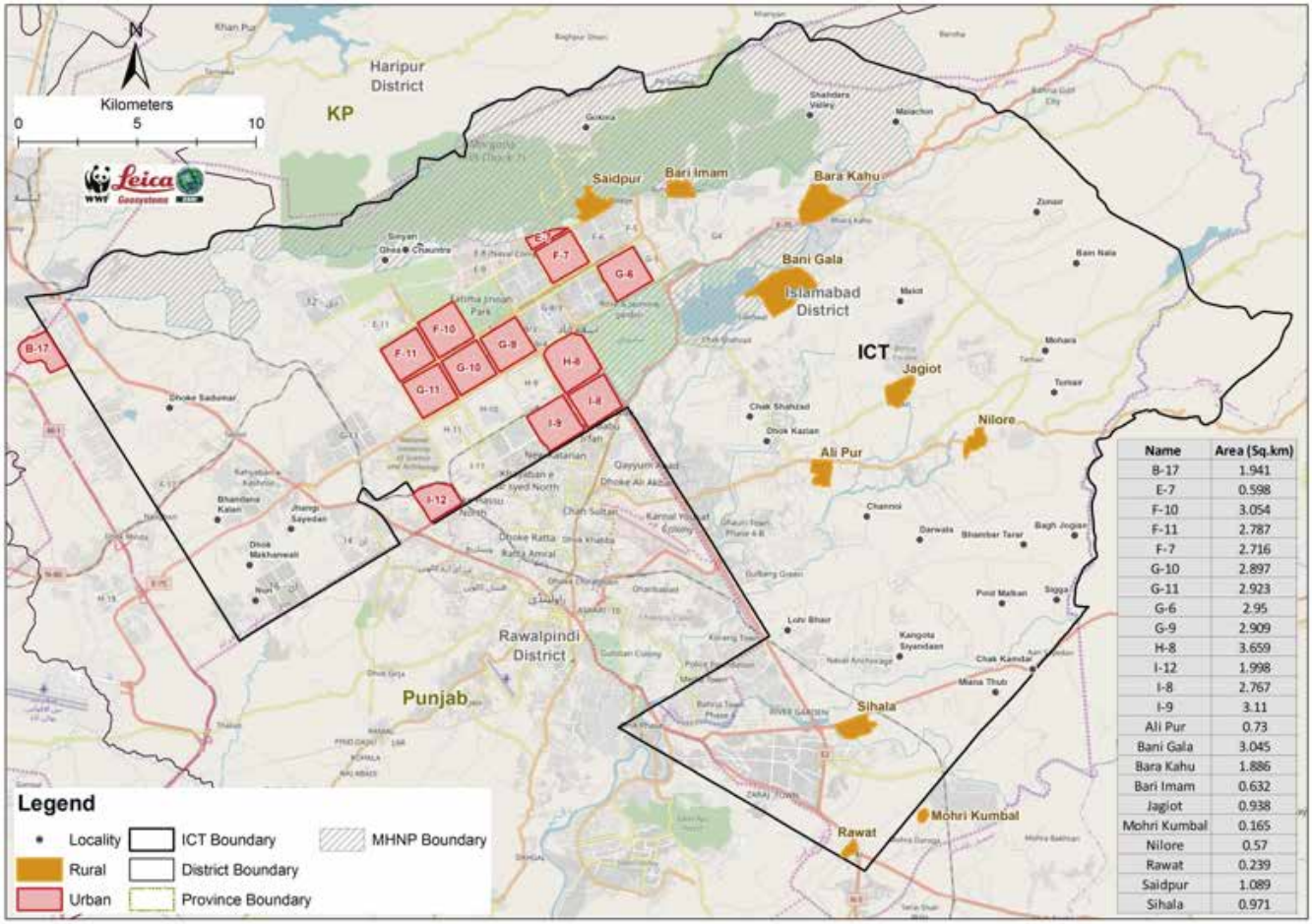



Figure 5: Scope Areas - ICT

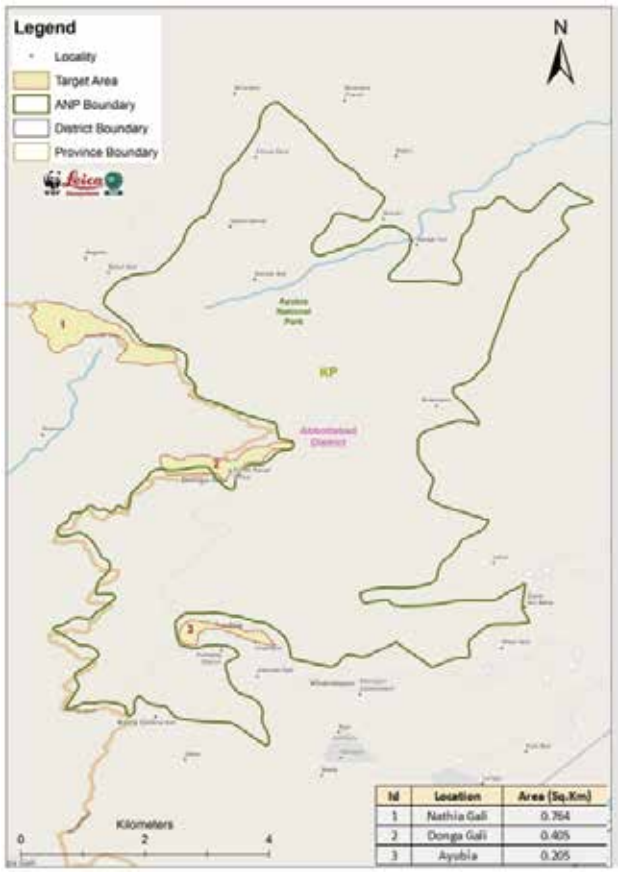



Figure 6: Scope areas - ANP

### 2.2.2 Ayubia National Park

In ANP, three major sites were chosen, which include: Nathiagalli, Dungagalli and Ayubia National Park. These areas were chosen via judgment sampling, keeping in view the high population density and seasonal influx of tourists in these areas in comparison with the rest of ANP.

## 2.3 ESTABLISHING A SAMPLE SIZE FOR PHYSICAL PLASTIC WASTE ASSESSMENT

To determine the sample size to conduct physical plastic waste quantification in the scope areas, the population density, affluence, rate of consumption, access to respondents and geographic spread were taken as reference. Therefore, the sample size of most categories in Islamabad is relatively larger compared to Ayubia National Park. Keeping in view the breadth of the scope area, and the longitudinal nature of the study, for each cycle of sampling a cumulative sample size of 1,280 has used in order to cover all stakeholders.

**For each cycle of sampling, a cumulative sample size of 1,280 has been used to cover all stakeholders.**

Table 2: Cumulative sample size of physical waste assessment in ICT and ANP

| Cumulative Sample count of Physical Waste Assessment on monthly basis | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Commercial | | | | | | |
| Areas | Residential area/ household | Shops/ Commercial Markets | Schools | Government Offices | Commercial entities/ Malls | Factory | Hospital | Landfill/ dumping site |
| Urban ICT | 396 | 264 | 60 | 12 | 24 | 36 | 36 | 12 |
| Rural ICT | 96 | 88 | 72 | 24 | 0 | 16 | 24 | 0 |
| Total | 492 | 352 | 132 | 36 | 24 | 52 | 60 | 12 |
| Total Sample Size ICT | 1160 | | | | | | | |
| ANP | 24 | 24 | 24 | 8 | 16 | 0 | 16 | 8 |
| Total Sample Size ANP | 120 | | | | | | | |
| Total Sample Size (ICT+ANP) | | | | 1280 | | | | |

### 2.3.1 Defining sample cycle for urban ICT

One cycle for urban ICT consists of 70 waste samples, breakdown of which has been provided in Table 2. Each cycle has been covered over a span of two days; and was repeated 3 times in a week. In order to observe the variation in disposal patterns throughout the week, 2 of the 3 cycles were completed on weekdays - Monday, Tuesday, Wednesday and Thursday - while the remaining were covered over the weekend - Friday and Saturday. The cycle frequency for urban ICT has been established keeping in view the high population density and overall waste generation. Cumulatively, a total of 3x4 cycles for urban ICT have been carried out for the duration of the data collection phase. This not only ensured that a substantial size of 840 was obtained but also enabled us to carry out a qualitative analysis of the disposal patterns of consumers in the plastic supply chain residing in urban ICT.

### 2.3.2 Defining sample cycle for rural ICT

One cycle for rural ICT consists of 40 waste samples, breakdown of which has been provided in Table 2. Each cycle has been covered over a span of two days; and was repeated twice in a week. In order to observe the variation in disposal patterns throughout the week, 1 of the 2 cycles were completed on weekdays - Tuesday and Wednesday - while the remaining were covered over the weekend - Friday and Saturday. The cycle frequency for rural ICT was established keeping in view the comparatively lower population and lesser development and consumption. Cumulatively, a total of 2x4 cycles for rural ICT were carried out for the duration of the data collection phase. This not only ensured that a substantial size of 320 was obtained but also enabled us to carry out a qualitative analysis of the disposal patterns of consumers in the plastic supply chain residing in rural ICT.

### 2.3.3 Defining sample cycle for ANP

One cycle for ANP consists of 15 waste samples, breakdown of which has been provided in Table 2. Each cycle has been covered over a span of one day; and was repeated twice in a week. In order to observe the variation in disposal patterns throughout the week, one cycle was completed on Thursday, while the second cycle was carried out on Saturday. The cycle frequency for ANP was established keeping in view the low population density and seasonal influx of tourists. Cumulatively, a total of 2x4 cycles for ANP were carried out for the duration of the data collection phase. This not only ensured that a substantial size of 120 was obtained but also enabled us to conduct a qualitative analysis of the disposal patterns of consumers in the plastic supply chain residing in ANP.

## 2.4 ESTABLISHING A SAMPLE SIZE FOR INTERVIEW / QUESTIONNAIRES

**780**
**interviews and questionnaires conducted**

To establish the sample size to conduct interviews and surveys, the population density, affluence, rate of consumption of plastics, and accessibility to selected stakeholders, was taken as a reference.

In ICT, the sample size for interviews was distributed keeping in view the population density, consumption patterns and at a tertiary level the accessibility of sample points for the surveyor. All identified stakeholders were interviewed and a concerted effort was made in order to cover all areas that came under the scope. The same principles used for the sample distribution of urban ICT were applied for the sample distribution of interviews in rural ICT.

In ANP, the sample size for interviews was further distributed keeping in view the population density, consumption patterns and at a tertiary level the accessibility of sample points for the surveyor. In a similar manner to ICT, all the defined stakeholders were interviewed to ensure the study covered all areas within the scope. Given below is the breakdown:

Table 3: Cumulative sample size of interviews and questionnaires administered in ICT and ANP

| Sample Size For Interviews/Questionnaires | | | | |
|---|---|---|---|---|
| **Scope Areas** | | **Islamabad** | **ANP** | **Total** |
| Junk dealers | | 5 | 1 | 6 |
| Waste collectors | Scavengers | 20 | 6 | 26 |
| | Municipal workers | 10 | 3 | 13 |
| Recyclers | | 3 | 1 | 4 |
| Households | | 600 | 50 | 650 |
| Shops/ Commercial | | 14 | 3 | 17 |
| Waste Sector | | 2 | 1 | 3 |
| Hospitals | | 9 | 2 | 11 |
| Schools | | 15 | 3 | 18 |
| Government Offices | | 7 | 1 | 8 |
| Manufacturer | | 3 | 0 | 3 |
| Restaurants | | 9 | 5 | 14 |
| Hotels | | 4 | 3 | 7 |

## 2.5 DATA COLLECTION TOOLS

For a comprehensive analysis of plastic waste in selected areas, a multi-pronged approach comprising of questionnaires, interviews, and waste sampling was utilized.

### 2.5.1 Questionnaires

Questionnaires for all categories of stakeholders with both open-ended and closed-ended questions were drafted by the project team and a door-to-door/ face-to-face data collection method was adopted. The questionnaires are attached in the Annexure-II.

### 2.5.2 Interviews

Interviews based on questionnaires were conducted with representatives of each stakeholder group. These interviews provided an opportunity for a more in-depth discussion between the interviewer and the interviewee. Through this instrument, surveyors obtained the points of view required in questionnaires and also made efforts to understand the untarnished perceptions of respondents.

### 2.5.3 Waste sampling

Waste samples from Islamabad Capital Territory and Ayubia National Park were taken from the sites identified in accordance with the categories, which include households, shops, schools, hospitals, commercial entities, government offices and landfill site/dump sites(s).

A three-tiered method was utilized to standardize the assessment at all sites:

i. Identification of site and quantification of total waste at site
ii. Selection of a random representative sample
iii. Sorting and quantification of all plastic categories.

A digital weighing machine was used to identify the representative sample and weigh each category of plastic. Additionally, GPS coordinates were marked and photographic evidence was also taken. This added to the significance of the study by providing a geographic reference.

The plastic waste sampled was generally segregated in accordance with the six main types of plastics: Polyethylene Terephthalate (PET), High-Density Polyethylene (HDPE), Polyvinyl Chloride (PVC), Low-Density Polyethylene (LDPE), Polypropylene (PP) and Polystyrene (PS). Wrappers, a mixed type of plastic product consisting of LDPE, PP and aluminium film (MLP- multi layered plastic), were classified as a seventh plastic type. Other than these types of plastic waste, occasional occurrence of other types of plastics such as Poly Carbonate and Nylon were also observed. These were noted under the umbrella heading of "Others".

Table 4: Categories of plastics

| 1 PET | 2 HDPE | 3 PVC | 4 LDPE | 5 PP | 6 PS | 7 OTHER |
|---|---|---|---|---|---|---|
| Polyethylene Terephthalate | High-density Polyethylene | Polyvinyl Chloride | Low-density Polyethylene | Polypropylene | Polystyrene | Others |
| Mineral water bottles, beverage bottles, carpet fiber | Milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys, toilet cleaning agents | Medical products, pipes, wires, synthetic leather, insulation on wires | Cling film, shopping bags, bubble wrap, sacks | Bottle tops, ketchup and syrup bottles, transparent food containers, straws | Styrofoam cups, plates and packaging | CDs, nylon net, hangers, biscuit and chip wrappers, gallon water bottles |

## 2.6 DATA ANALYSIS THROUGH SPSS / MICROSOFT EXCEL

# Interview and waste sampling data was analyzed using SPSS 21 and Microsoft Excel.

Data entries were carried out through Google forms by all field officers and the data was further transferred to .csv and .sav files in Excel and SPSS 21, respectively. Waste sampling data was structured as panel data arranged from latest to oldest. For both interviews and waste sampling data sets for ICT and ANP, descriptive statistics of the predefined and recomputed variables, after data cleaning, have been used for the analysis chapter.

# RESULTS FROM WASTE SAMPLING

## 3.1 ESTIMATED QUANTITY OF PLASTICS GENERATED IN ICT AND ANP

Table 5: Estimated quantity of plastics in ICT and ANP as per waste generation

| Total Quantity of Plastics found in ICT and ANP as per its Waste Generation | | |
|---|---|---|
| | ICT | ANP |
| Waste Generated (tons/day) | 650 | 6.5 |
| Waste Generated (tons/month) | 19500 | 195 |
| Total Waste at Sample site (tons/month) | 854.42 | 3.73 |
| Quantity of Waste Sampled (tons/month) | 6.5 | 0.762 |
| Quantity of Plastics found in the Waste Sampled (tons/month) | 0.925 | 0.37 |
| Percentage of Plastics in Waste Sampled | 14.26% | 48.56% |
| Estimated Quantity of Plastics in Waste Generated (tons/month) | 2780.6 | 94.7 |

The total quantity of plastic waste generated in ICT and ANP was estimated using the percentages of total plastic found and the total waste generated in each area. The estimated percentage of plastics found in waste sampled in ICT was **14.26%**, while in ANP it was **48.56%**. These percentages were calculated after finding the cumulative quantities of plastic waste in the total waste sampled over weekdays and weekends within the entire month. These percentages were extrapolated in accordance with the total monthly waste generation of ICT and ANP. Resultantly, **2780.6 tons/month** of plastic waste generation was found in ICT and **94.7 tons/month** was found in ANP.

The percentage of plastics in waste sampled in ANP was much greater than the percentage in ICT. This difference can be attributed to the high influx of tourists in ANP year round, and hence a higher volume of single-use plastic waste generated.

## 3.2 RESULTS FROM THE WASTE ASSESSMENTS IN ICT

### 3.2.1 Cumulative characterization of plastic waste in ICT

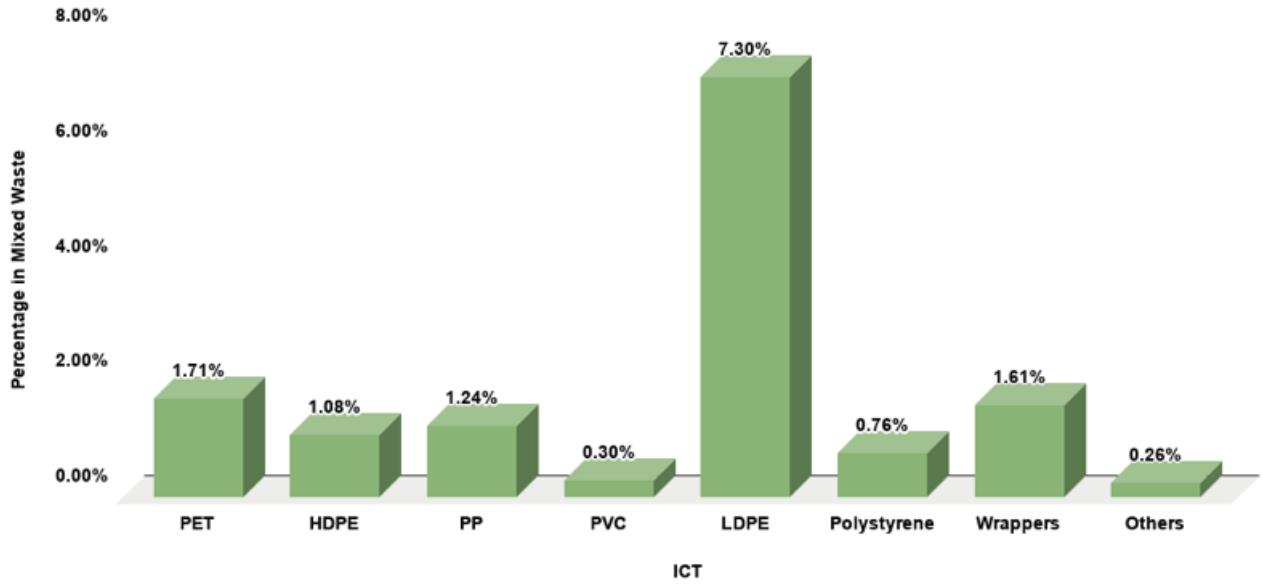



Figure 7: Cumulative characterization of plastic waste in ICT

Throughout ICT, numerous types of plastic items were found in varying numbers. Cumulatively, however, as seen from Figure 7, LDPE was the most frequently found plastic waste type in waste streams. It can hence be inferred that even after the ban on plastic bags in ICT, the general populace is still very inclined to use such bags in their daily routines. Table 6 shows the quantities of various types of plastics on a daily, monthly and yearly basis, in ICT as per the sample size.

Table 6: Overall characterization of plastic waste - ICT

| ICT Plastic Waste Characterization | | | | | | |
|---|---|---|---|---|---|---|
| Plastic Type | Total Sample Quantity (tons) | Quantity of Plastic in Sampled Mixed Waste (tons) | Percentage out of Mixed Waste | Daily Generated Quantity of Plastic Waste (tons/day) | Monthly Generated Quantity of Plastic Waste (tons/month) | Yearly Generated Quantity of Plastic Waste (tons/year) |
| PET | 6.5 | 0.1 | 1.71% | 11.1 | 332.9 | 4050 |
| HDPE | 6.5 | 0.07 | 1.08% | 7 | 210.4 | 2560 |
| PP | 6.5 | 0.08 | 1.24% | 8.1 | 242.7 | 2953 |
| PVC | 6.5 | 0.02 | 0.30% | 1.9 | 58 | 705 |
| LDPE | 6.5 | 0.5 | 7.30% | 47.4 | 1423.1 | 17314 |
| Polystyrene | 6.5 | 0.05 | 0.76% | 4.9 | 148.4 | 1805 |
| Wrappers | 6.5 | 0.1 | 1.61% | 10.5 | 314.2 | 3822 |
| Others | 6.5 | 0.02 | 0.26% | 1.7 | 50.9 | 620 |
| Total Plastic | 6.5 | 0.8 | 14.26% | 92.7 | 2780.7 | 33832 |

### 3.2.2 Characterization of plastic waste in ICT over weekend and weekday

## The total waste sampled is 6.5 tons in both urban and rural ICT.

Figure 8 is generated by taking into account the total waste sampled (6.5 tons) in both urban and rural ICT, throughout the data collection phase. From Figure 8 it can be observed that LDPE is the most common form of plastic waste found in waste streams, followed by wrappers and PET. It is important to mention that the percentage of PET and HDPE is not a true representation as there is excessive scavenging of these post-consumer products.

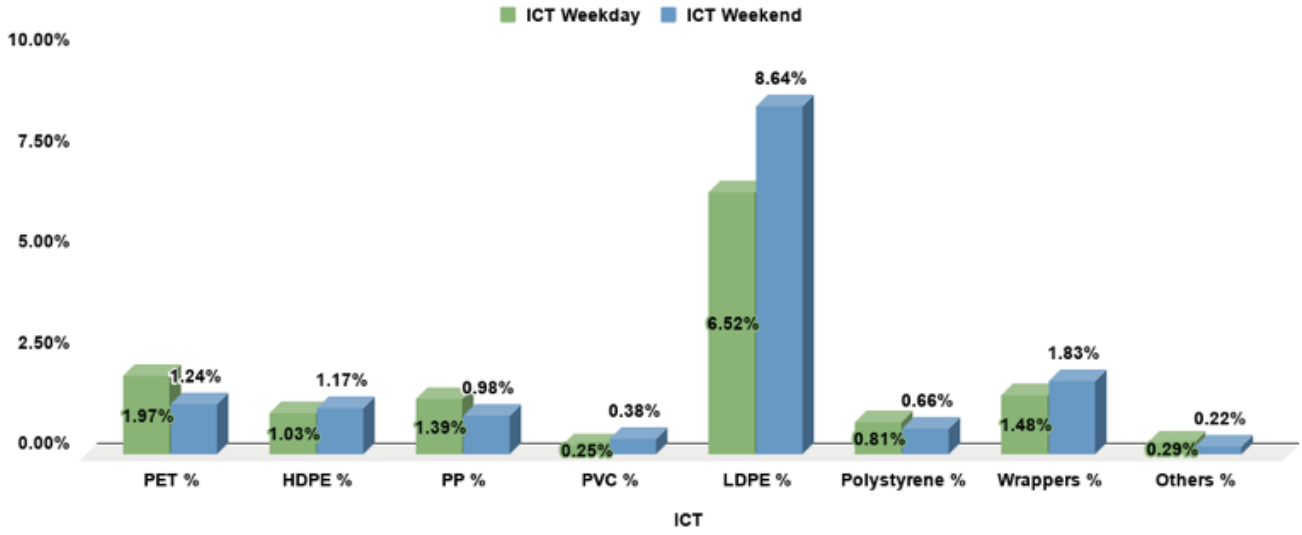



Figure 8: Overall characterization of plastic waste in ICT

Table 7 and Table 8 show estimated quantities and percentages of each type of plastic generated during weekdays and weekends in ICT.

## Table 7: Characterization of plastic waste generated during weekdays - ICT

| ICT Plastic Waste Characterization- Weekdays | | | | | | |
|---|---|---|---|---|---|---|
| Plastic Type | Total Sample Quantity (tons) | Quantity of Plastic in Sampled Mixed Waste (tons) | Percentage out of Mixed Waste | Daily Generated Quantity of Plastic Waste (tons/day) | Monthly Generated Quantity of Plastic Waste (tons/month) | Yearly Generated Quantity of Plastic Waste(tons/year) |
| PET | 4.1 | 0.081 | 1.97% | 12.8 | 222.6 | 2671 |
| HDPE | 4.1 | 0.043 | 1.03% | 6.7 | 116.3 | 1396 |
| PP | 4.1 | 0.058 | 1.39% | 9 | 157.3 | 1888 |
| PVC | 4.1 | 0.01 | 0.25% | 1.6 | 28.1 | 338 |
| LDPE | 4.1 | 0.27 | 6.52% | 42.4 | 737.9 | 8854 |
| Polystyrene | 4.1 | 0.034 | 0.82% | 5.3 | 92.3 | 1107 |
| Wrappers | 4.1 | 0.106 | 2.57% | 16.7 | 290.2 | 3482 |
| Others | 4.1 | 0.009 | 0.21% | 1.3 | 23.5 | 281 |
| Total Plastic | 4.1 | 0.611 | 14.75% | 95.9 | 1668.2 | 20018 |

## Table 8: Characterization of plastic waste generated during weekends - ICT

| ICT Plastic Waste Characterization- Weekend | | | | | | |
|---|---|---|---|---|---|---|
| Plastic Type | Total Sample Quantity (tons) | Quantity of Plastic in Sampled Mixed Waste (tons) | Percentage out of Mixed Waste | Daily Generated Quantity of Plastic Waste (tons/day) | Monthly Generated Quantity of Plastic Waste (tons/month) | Yearly Generated Quantity of Plastic Waste (tons/year) |
| PET | 2.3 | 0.029 | 1.25% | 8.1 | 105.3 | 1264 |
| HDPE | 2.3 | 0.027 | 1.17% | 7.6 | 98.7 | 1185 |
| PP | 2.3 | 0.023 | 0.99% | 6.4 | 83.3 | 1000 |
| PVC | 2.3 | 0.009 | 0.38% | 2.5 | 32.4 | 388 |
| LDPE | 2.3 | 0.203 | 8.66% | 56.3 | 732 | 8784 |
| Polystyrene | 2.3 | 0.016 | 0.66% | 4.3 | 56.1 | 674 |
| Wrappers | 2.3 | 0.045 | 1.92% | 12.5 | 162 | 1943 |
| Others | 2.3 | 0.003 | 0.13% | 0.8 | 10.9 | 130 |
| Total Plastic | 2.3 | 0.356 | 15.16% | 98.5 | 1280.7 | 15368 |

## 3.2.3 Sector-wise plastic generation

Figure 9 represents the percentage of plastic waste found in each site surveyed in ICT. These results have been developed by taking into account the total amount of waste sampled in respective site over the course of the data collection phase. It can be assessed from the findings that in urban ICT, I-12 produces the largest amount of plastic waste, presumably because the official dumpsite designated for Islamabad is situated there. Similarly, from rural ICT, Rawat produces the highest percentage of plastic waste, which can be attributed to the plethora of factories and small to medium enterprises present in the area.

**I-12 and Rawat produces the highest percentage of plastic waste.**

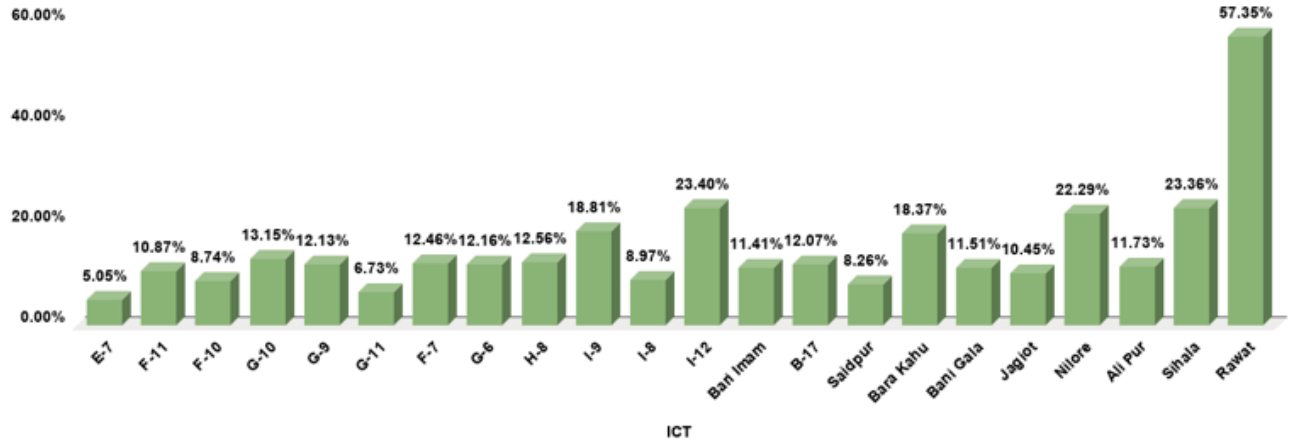



Figure 9: Overall sector wise characterization of plastic waste in ICT

## 3.2.4 Plastic waste characterization with reference to stakeholders

**It was observed that the proportion of plastic waste generation in mixed waste was the highest in factories, government, offices and shopping malls.**

Figure 10 was obtained by taking into account the total waste sampled in both urban and rural ICT, throughout the data collection phase, from the waste streams of each respective stakeholder. In urban ICT, there are 45,710 privately owned and 16,500 government owned residential units, making a total of 62,210 urban residential units. Moreover, there are 16,902 commercial units in the urban sectors of ICT, out of which the overwhelming majority consists of shops/stores.

**The proportion of plastic waste in mixed waste generated was lowest in residential units and shops.**

As shown in Figure 10, it was observed that the proportion of plastic waste generation in mixed waste was the highest in factories, government offices and shopping malls. On the other hand, the proportion of plastic waste in mixed waste generated was lowest in residential units and shops.

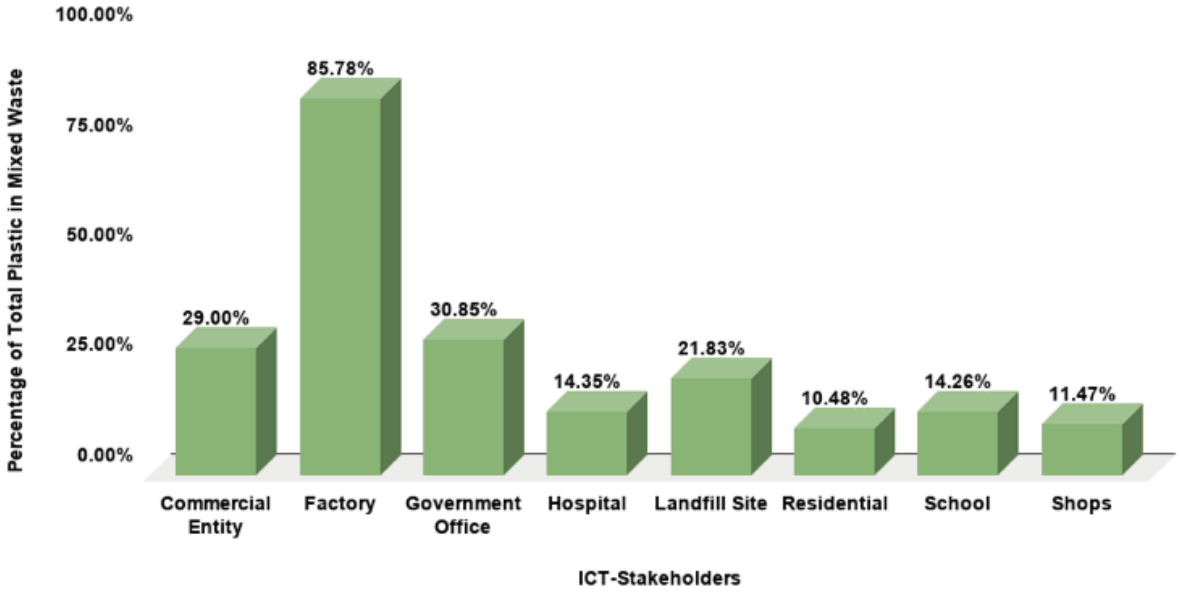



Figure 10: Overall characterization of plastic waste in ICT in accordance with stakeholders

## 3.2.5 Plastic waste generation patterns of all stakeholders in ICT

Figure 11: Dumpsite in commercial area of F-11

Figure 12 shows the prevalence of different types of plastics in waste streams of each stakeholder in ICT. In factories, the plastic waste consisted of mostly LDPE. As shown in Figure 12, LDPE is the most prevalently found plastic type in ICT. The proportion of LDPE in mixed waste is also significantly higher in landfill/dumpsite, commercial entities (shopping malls), shops, residential units and schools. The second most commonly found plastic type is PET, which is generated in the highest percentage in schools, commercial entities (shopping malls), hospitals and government offices. It is found in a lower proportion in residential units and shops. The least proportion is found in I-12 landfill/dumpsite. This reflects the scavenging of waste from residential units and shops as well as the I-12 landfill/dumpsite. Hospitals generate the most PVC as medical products are packaged, stored and used in PVC containers. It is also generated in residential units, mostly as used and unused wiring. The landfill/dumpsite also shows some proportion of PVC waste. The highest proporton of PP is found in the mixed waste of hospitals, followed by descending proportions in residential units, shops, commercial entities (shopping malls) and the I-12 landfill/dumpsite. The highest proportion of HDPE is generated in residential units, schools, shops and hospitals; it is generated in low proportions in commercial entities (shopping malls) and factories.

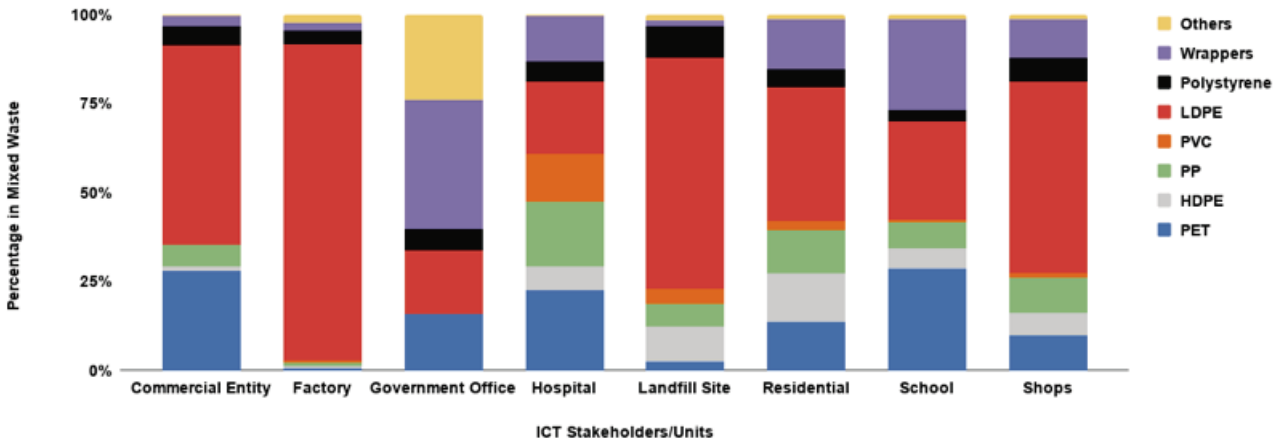



Figure 12: Plastic waste generation patterns of all stakeholders in ICT

Polystyrene is found among all stakeholder groups in ICT, with the highest portion found in commercial entities (shopping malls), followed by hospitals and shops. Polystyrene is also prevalent in government offices, residential units, schools, and factories. The I-12 dumpsite/landfill also has a significant amount of polystyrene.

Wrappers form the highest proportion of mixed waste found in government offices. In other stakeholder types, such as schools, residential areas, hospitals and shops, quantities of wrappers are relatively less. The least percentage is found in factories, commercial entities and landfill/dumpsite.

Other types of plastic waste including mixed plastic water gallons, hangers, files, CDs etc. are found in high percentages in the mixed waste of government offices but to a lesser degree in all other stakeholders groups.

Figure 13: Segregated plastics from waste sample in G-9

Figure 14: Waste at 1-12 dumpsite

## 3.3 RESULTS FROM THE WASTE ASSESSMENTS IN ANP

### 3.3.1 Cumulative characterization of plastic waste in ANP

Throughout ANP, a popular tourist destination throughout the year, numerous types of plastics were found in varying numbers. Cumulatively, as seen in Figure 15, LDPE and PET were the most frequently found plastic waste types in the waste stream to. Most single-use items such as beverage bottles and shopping bags are made of the two aforementioned plastic types, and therefore relatively higher percentages of LDPE and PET are found in the waste streams of ANP. Table 9 shows the quantities of various types of plastics on a daily, monthly and yearly basis, in ANP as per the sample size.

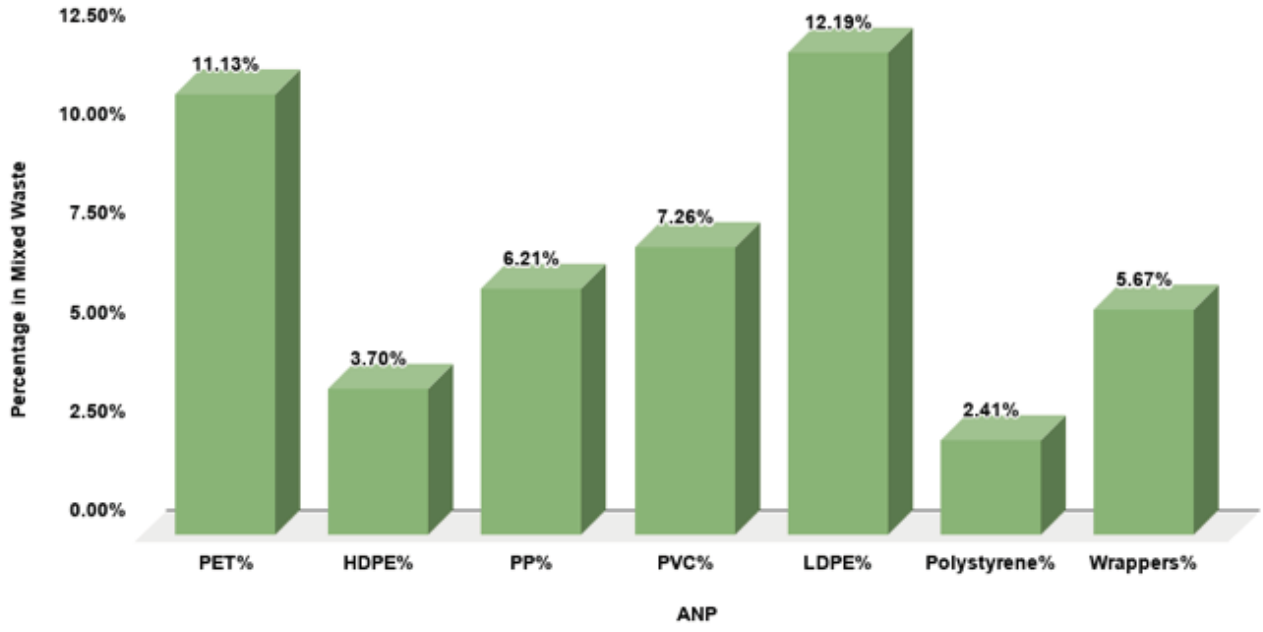



Figure 15: Cumulative characterization of plastic waste in ANP

Table 9: Overall characterization of plastic waste - ANP

| ANP Plastic Waste Characterization | | | | | | |
|---|---|---|---|---|---|---|
| Plastic Type | Total Sample Quantity (tons) | Quantity of Plastic in Sampled Mixed Waste | Percentage out of Mixed Waste | Daily Generated Quantity of Plastic Waste (tons/day) | Monthly Generated Quantity of Plastic Waste (tons/day) | Yearly Generated Quantity of Plastic Waste (tons/year) |
| PET | 0.8 | 0.08 | 11.10% | 0.7 | 22 | 264 |
| HDPE | 0.8 | 0.03 | 3.70% | 0.2 | 7.3 | 88 |
| PP | 0.8 | 0.05 | 6.20% | 0.4 | 12.3 | 147 |
| PVC | 0.8 | 0.06 | 7.30% | 0.5 | 14.3 | 172 |
| LDPE | 0.8 | 0.09 | 12.20% | 0.8 | 24.1 | 289 |
| Polystyrene | 0.8 | 0.02 | 2.40% | 0.2 | 4.8 | 57 |
| Wrappers | 0.8 | 0.04 | 5.70% | 0.4 | 11.2 | 135 |
| Total Plastic | 0.8 | 0.37 | 48.60% | 3.2 | 96 | 1151 |

## 3.3.2 Characterization of plastic waste in ANP on weekend and weekday

**0.8 tons**

**total waste sampled**

Figure 16 is generated by taking into account the total waste sampled (0.762 tons ≈ 0.8 tons) in Ayubia National Park, throughout the data collection phase. From this representation, it can be observed that PET is the most frequently found plastic waste in waste streams, followed by LDPE. Due to the extensive tourism in this area, it comes as no surprise that PET and LDPE have the highest percentages, as both types of plastic are extensively used in the production of items such as water/drink bottles and plastic bags etc. Table 10 and Table 11 show the estimated quantities and percentages of each type of plastic generated on weekdays and weekends in ANP.

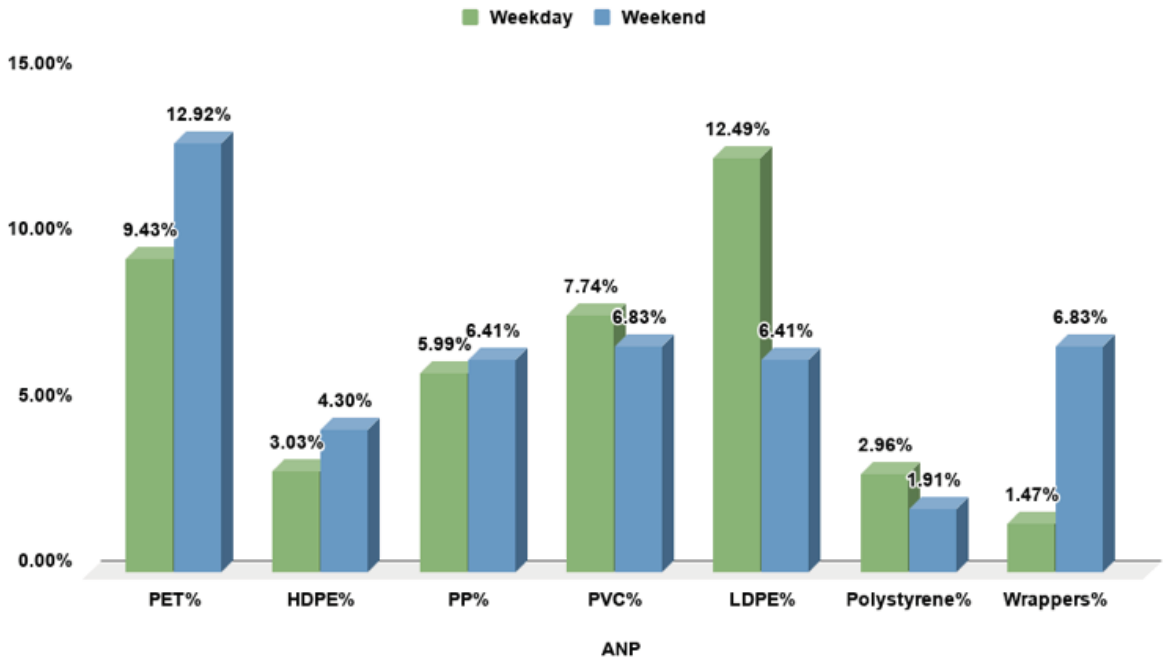



Figure 16: Overall characterization of plastic waste in ANP

## Table 10: Characterization of plastic waste generated on weekdays - ANP

| ANP Plastic Waste Characterization-Weekdays | | | | | | |
|---|---|---|---|---|---|---|
| Plastic Type | Total Sample Quantity (tons) | Quantity of Plastic in Sampled Mixed Waste | Percentage out of Mixed Waste | Daily Generated Quantity of Plastic Waste (tons/day) | Monthly Generated Quantity of Plastic Waste (tons/day) | Yearly Generated Quantity of Plastic Waste (tons/year) |
| PET | 0.4 | 0.03 | 9.43% | 0.6 | 10.7 | 128 |
| HDPE | 0.4 | 0.01 | 3.03% | 0.2 | 3.4 | 41 |
| PP | 0.4 | 0.02 | 5.99% | 0.4 | 6.8 | 81 |
| PVC | 0.4 | 0.03 | 7.74% | 0.5 | 8.8 | 105 |
| LDPE | 0.4 | 0.04 | 12.49% | 0.8 | 14.1 | 170 |
| Polystyrene | 0.4 | 0.01 | 2.96% | 0.2 | 3.4 | 40 |
| Wrappers | 0.4 | 0.01 | 1.47% | 0.1 | 1.7 | 20 |
| Total Plastic | 0.4 | 0.17 | 47.01% | 3.1 | 53.2 | 638 |

## Table 11: Characterization of plastic waste generated on weekends - ANP

| ANP Plastic Waste Characterization-Weekend | | | | | | |
|---|---|---|---|---|---|---|
| Plastic Type | Total Sample Quantity (tons) | Quantity of Plastic in Sampled Mixed Waste | Percentage out of Mixed Waste | Daily Generated Quantity of Plastic Waste (tons/day) | Monthly Generated Quantity of Plastic Waste (tons/day) | Yearly Generated Quantity of Plastic Waste (tons/year) |
| PET | 0.4 | 0.05 | 12.92% | 0.84 | 10.92 | 131 |
| HDPE | 0.4 | 0.02 | 4.30% | 0.28 | 3.63 | 43.6 |
| PP | 0.4 | 0.03 | 6.41% | 0.42 | 5.41 | 65 |
| PVC | 0.4 | 0.03 | 6.83% | 0.44 | 5.77 | 69.2 |
| LDPE | 0.4 | 0.05 | 6.41% | 0.42 | 5.41 | 65 |
| Polystyrene | 0.4 | 0.01 | 1.91% | 0.12 | 1.61 | 19.4 |
| Wrappers | 0.4 | 0.02 | 6.83% | 0.44 | 5.77 | 69.2 |
| Total Plastic | 0.4 | 0.2 | 49.95% | 3.25 | 42.21 | 506.5 |

## 3.3.3 Sector wise plastic generation

Figure 17 represents the percentage of plastic waste found in each site surveyed in ANP. The representations have been developed by taking into account the total amount of waste sampled in respective sites over the course of the data collection phase. It can be assessed from the results that all three sites receive excessive amounts of plastic in their waste streams. These unusually large percentages can be attributed to the huge influx of tourists that visit these areas throughout the year. These tourists frequently use single-use plastic items. Generally, these single-use plastic items are made up of the seven types of plastics that have been identified in this report.

As shown in Figure 17, Ayubia National Park is the recipient of the most amount of plastic in its waste stream. This can be attributed to the fact that it is a very popular site among tourists who visit for a limited time period and inevitably use a lot of single-use plastic items such as bottles, polythene bags, wrappers etc.

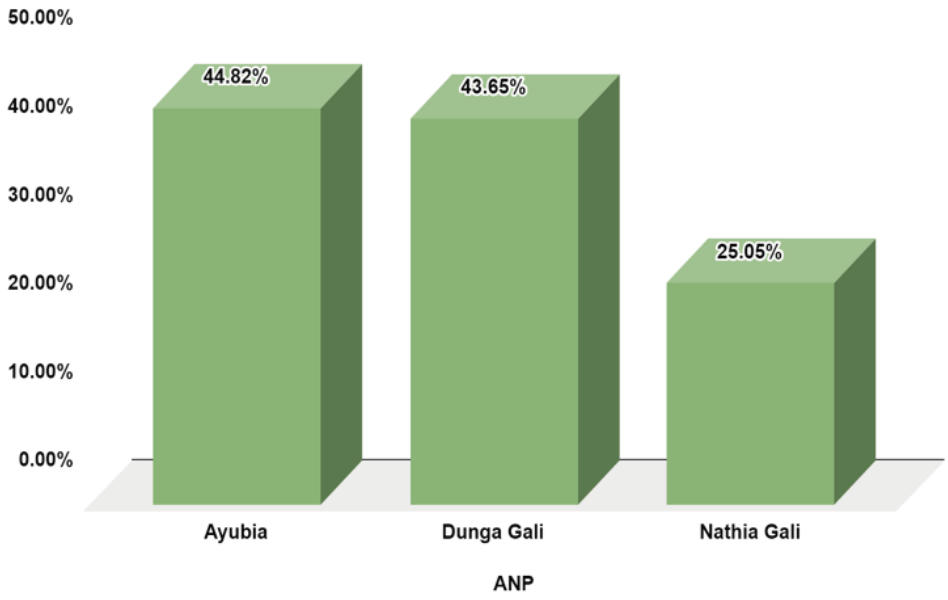



Figure 17: Overall sector wise characterization of plastic waste in ANP

## 3.3.4 Plastic waste characterization with reference to stakeholders

Figure 18 has been generated by taking into account the total waste sampled in ANP, throughout the data collection phase from the mixed waste streams of each respective stakeholder. According to the Galliyat Development Authority, there are 420 households, 100 shops, 50 hotels, two hospitals and three schools in the Ayubia National Park area. Figure 18 shows that the total percentage of plastics in mixed waste is highest for residential units, followed by hospitals, commercial entities (large stores/shops), shops, schools and government offices. The percentage of plastics in mixed waste in residential areas, coupled with the number of households suggests that they are the most significant stakeholder in terms of plastic waste generation. On the other hand, hospitals and commercial entities (large stores) also have a high percentage of plastic in their mixed waste but their total number of units is very small.

**There are 420 households, 100 shops, 50 hotels, two hospitals and three schools in Ayubia National Park.**

The reason why residential waste streams show such a large amount of plastics is because many of the skips designated for residential waste receive waste from other stakeholders as well such as markets etc.

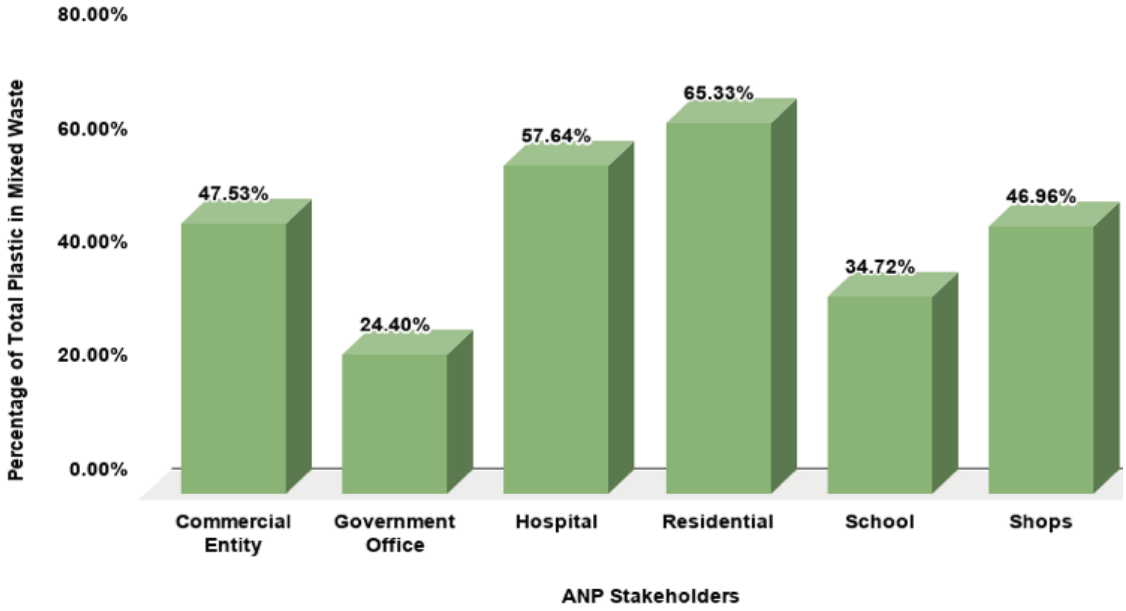



Figure 18: Overall characterization of plastic waste in ANP in accordance with stakeholders

## 3.3.5 Plastic waste generation patterns of all stakeholders in ANP

Figure 20 represents the prevalence of different types of plastics in the waste streams of each stakeholder group in ANP. The percentage of LDPE in mixed waste is highest in shops, followed by government offices, schools and commercial entities. On the other hand, its proportion is relatively lower in residential areas and hospitals. The PET plastic type percentage in mixed waste is the highest in commercial entities (large stores), shops and residential areas. It is generated in a relatively lower proportion in government offices, hospitals and schools. Plastic PVC waste is generated in the highest proportion in hospitals, residential areas, commercial entities (large stores) and shops. It is found in negligible quantities in schools and government offices. The PP plastic type is in a significantly high proportion in schools, followed by residential areas, hospitals and government offices. It is found in the smallest proportions in mixed waste generated by shops and commercial entities.

The highest proportion of HDPE is found in the mixed waste of hospitals and commercial entities and relatively lower proportions in shops and residential areas. HDPE plastic waste was not found in any measurable quantity in mixed waste of schools and government offices. Polystyrene was found in sizeable proportions in mixed waste of government offices, shops and commercial entities. It was found in relatively low percentage of mixed waste generated by hospitals, residential areas and schools. The mixed waste category of "wrappers" was found in relatively high percentage of mixed waste in schools, government offices, shops and commercial entities (large stores). It was found in relatively low percentage in mixed waste generated by hospitals.


Figure 19: Assistance provided by GDA's field officer in Dunga Galli

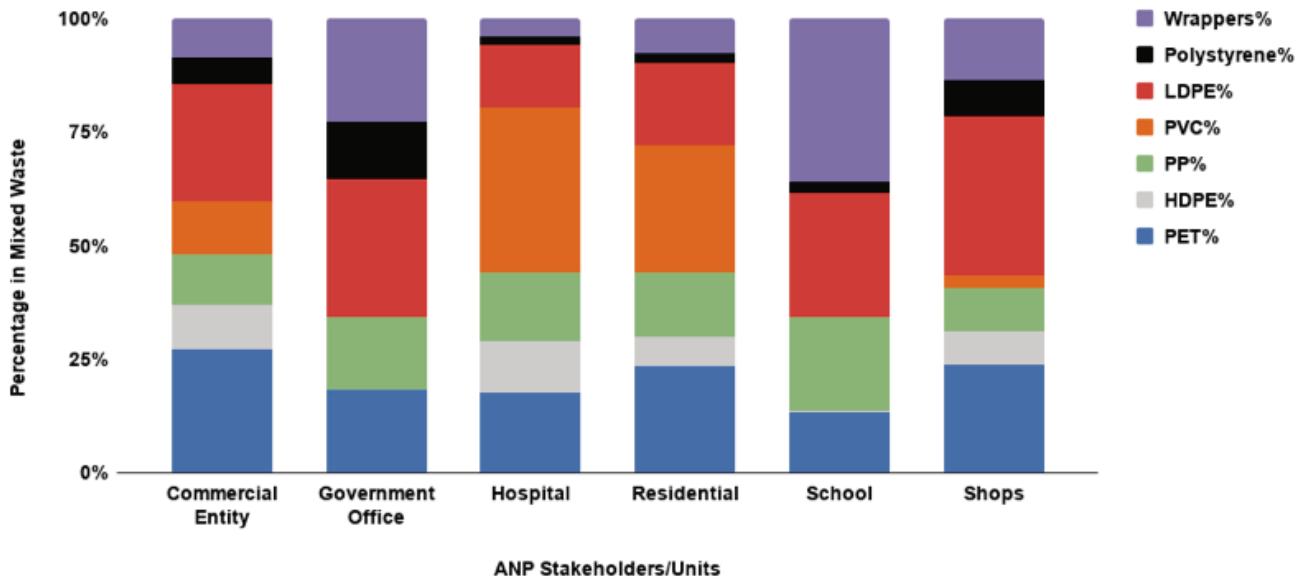



Figure 20: Plastic waste generation patterns of all stakeholders in ANP


Figure 21: Sorting of different types of plastics from mixed waste in Nathiagali

Figure 22: Weighing of plastic found in waste sample of Ayubia

# RESULTS FROM INTERVIEWS / QUESTIONNAIRES

## 4.1 OVERALL REPRESENTATION OF RECYCLING / REUSE TREND AMONG CONSUMERS

Figure 23 shows the response of household consumers from ICT and ANP on the reuse/ recycle probability of plastic items. Almost **59%** of respondents were recorded to reuse plastic items while almost **41%** of respondents did not reuse plastics. Out of the 59% who replied in affirmation, most of them reported to mainly reuse PET and LDPE items while occasionally reusing HDPE made products.

**41%**
**of respondents did not reuse plastics**

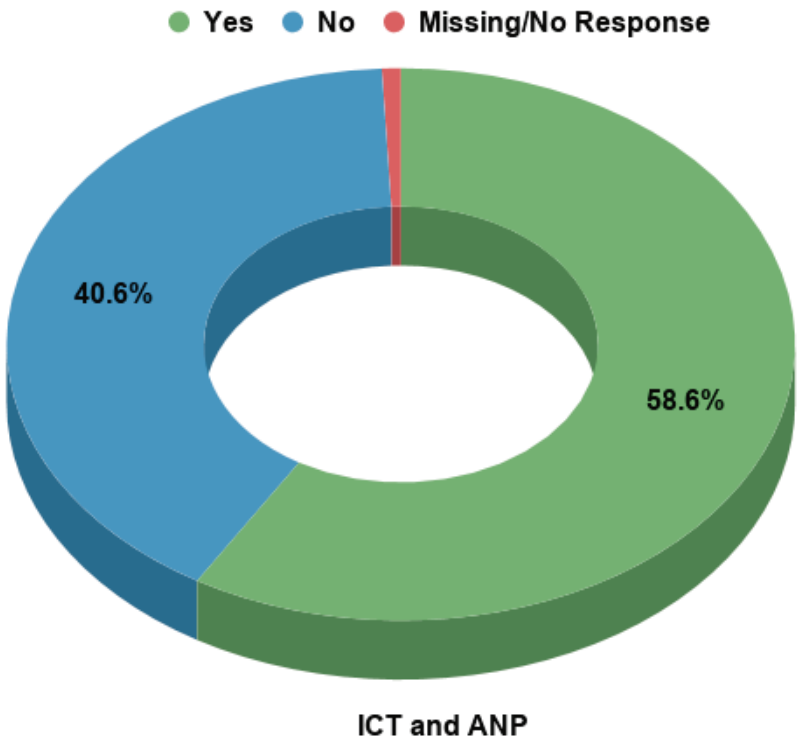



Figure 23: Consumer response on reuse/recycle probability of plastics

## 4.2 RESULTS FROM INTERVIEWS QUESTIONNAIRES ADMINISTERED IN ICT

### 4.2.1 Characterization of generation patterns in ICT

Figure 24 has been derived by analyzing the generation pattern of the following stakeholders: households, shops, hotels, schools, government offices, malls/markets, and restaurants. These stakeholders are the sources of plastic pollution in the environment and therefore the analysis of their generation pattern holds immense importance. The representations shown in the figure illustrate the percentage of stakeholders that concede to using various plastic types as well as those who do not consume them.

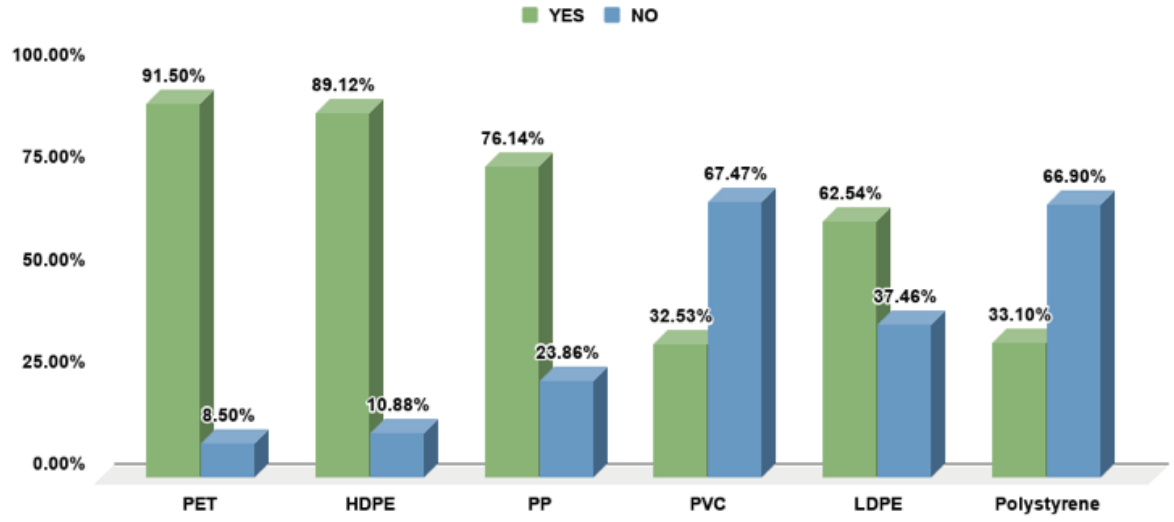



Figure 24: Characterization of generation pattern in ICT

## 4.2.2 Analysis of formal collection

The formal waste management responsible for almost all of ICT is the CDA. The CDA's ordinance of 1960 authorizes it to perform functions that include "cleanliness and health" of the citizens of Islamabad.[7] This mechanism is designed to include collection, transportation and safe disposal of solid waste collected from residential and commercial areas, as well as open spaces. According to UNESCAP, the collection of waste from residential/ commercial areas in all sectors of Islamabad is once a day between 9.00 AM and 12.00 PM. Hydraulic refuse packers (garbage compacting vehicles), skip lifters, dump trucks and trolleys collect the accumulated waste, green /garden waste, debris, building material or other scattered waste for transportation to a final disposal site once a day from 8.00 AM to 4.00 PM.[8] All waste collected during the cleansing operation is transported to the designated final disposal site in I-12.

The respondent from CDA intimated that approximately 650 tons of waste is generated in ICT on a daily basis, and collection efficiency was reported to be approximately 80%. When enquired about the areas of improvement, the respondent commented that the leading issues faced in waste collection in the current status quo were: the lack of awareness among the people of ICT as almost none of them segregate waste at source, and the lack of resources.

The CDA's ordinance of 1960 authorizes it to perform functions that include **cleanliness and health.**

7 http://www.cda.gov.pk/documents/docs/cda-ordinance-1960.pdf.
8 https://www.unescap.org/sites/default/files/baseline%20survey_islamabad_finalised.pdf

### 4.2.3 Plastic waste types reported by informal waste collectors

Figure 25 represents the analysis of the information received by the informal sector with regards to the types of plastic collected, purchased, and sold by them. Respondents include junk dealers, municipal workers, and scavengers. Although, municipal workers come under the formal waste management system because they also take part in scavenging, their responses for ascertaining the trend have also been included. As can be observed from Figure 25, **PET** was found to be the most profitable item on their list and therefore respondents from the informal waste sector reported to collect PET. A similar trend can be seen in the case of **HDPE**. This trend also explains and justifies the relatively low percentage of PET and HDPE found in waste streams of ICT.

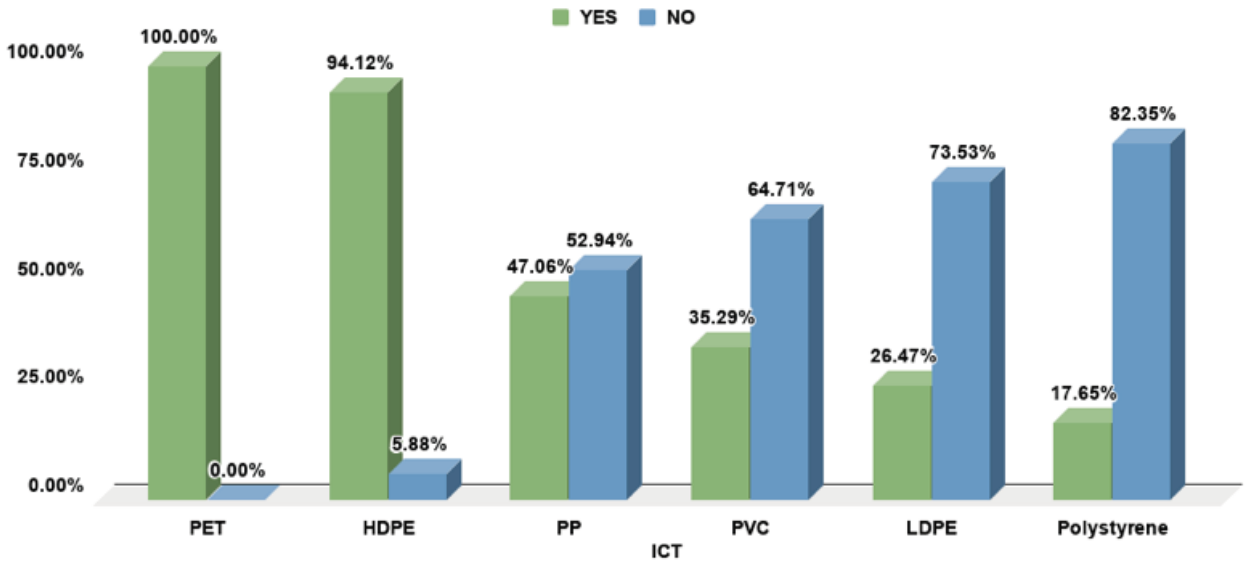



Figure 25: Plastic waste types reported by informal waste collectors

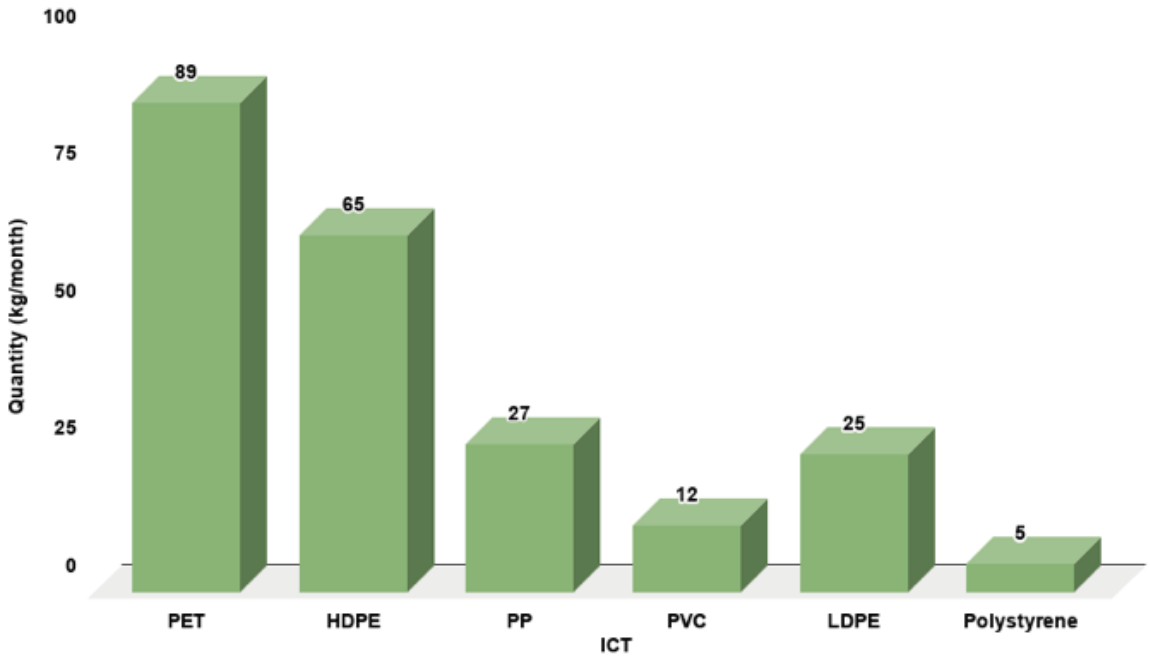



Figure 26: Average quantity of plastic waste collected by scavengers / month

Figure 26 represents that on average, for scavengers and MCI workers, **PET** is the most sought after post-consumer plastic waste item followed by **HDPE.**

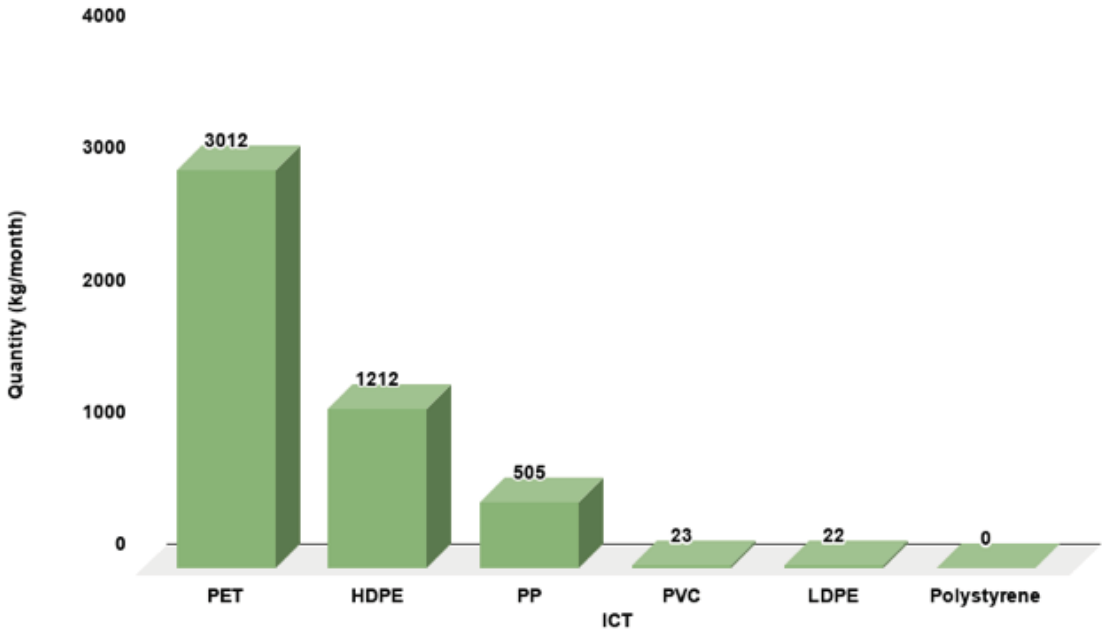



Figure 27: Average quantity of plastic waste collected by junk dealers / month

Figure 27 shows that on average, for junk dealers, PET is the most sought after post-consumer plastic waste item followed by **HDPE.**

### 4.2.4 Sources of waste for scavengers in ICT

Figure 28 shows the trend scavengers and MCI workers have shown with respect to their collection sources. As can be seen from the figure almost 50% of respondents reported that their source of scavenging are residential areas. In retrospect it may also refer to the fact that almost half of the scavenging is carried out before secondary collection by authorities. This again reiterates the claims made in the previous sections about the relatively lower amounts of PET, HDPE and PVC found in waste streams of the sampling sites and ICT in general.

**50% of respondents reported their source of scavenging are residential areas.**

### 4.2.5 Problems reported by scavengers / MCI workers

Scavengers and MCI workers face a number of problems that need to be resolved so that they continue to effectively perform their duties of the plastic waste cycle. Figure 29 shows that the biggest problem faced by waste pickers is that of inconsistent income. On one hand, they do not have any certainty regarding a consistent flow of plastic waste. On the other hand, they do not have any formal contracts with junk dealers and recyclers. Therefore, they may or may not be able to obtain a desirable income from the labour that they invest in waste segregation in any given week or month. Moreover, formal waste pickers are mostly contractual or temporary workers of the formal waste sector. These are paid no more than the minimum wage and have little job security. Moreover, waste pickers face increasing competition in their work from other waste pickers and private companies, which have introduced waste segregation. Apart from these economic problems, waste pickers also report that society has assigned them a low status and they experience stigmatization attached to their occupation.

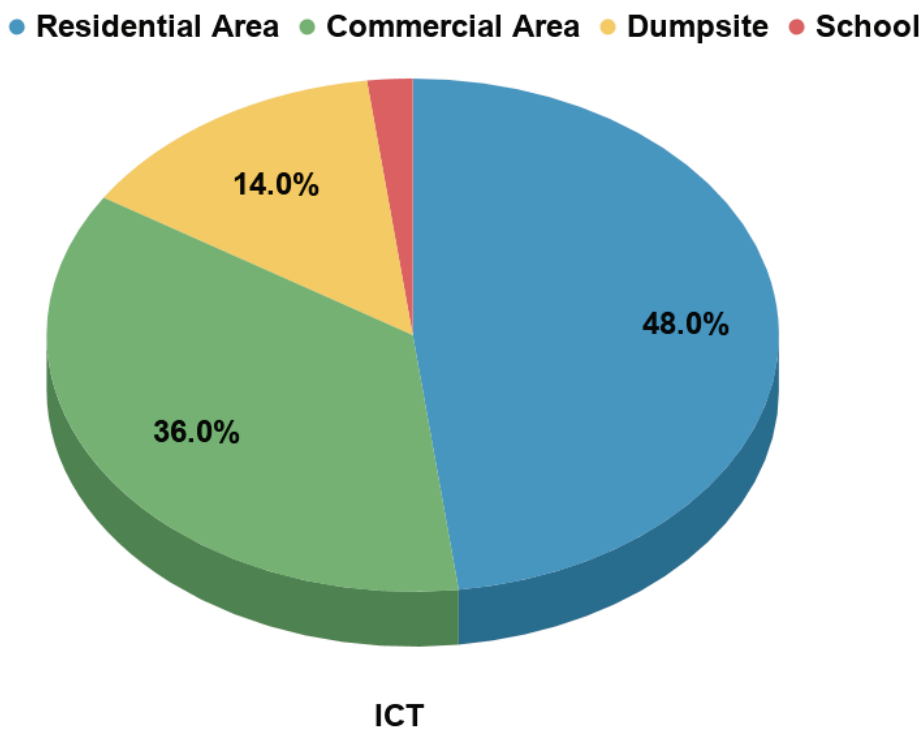



Figure 28: Sources of waste for scavengers in ICT

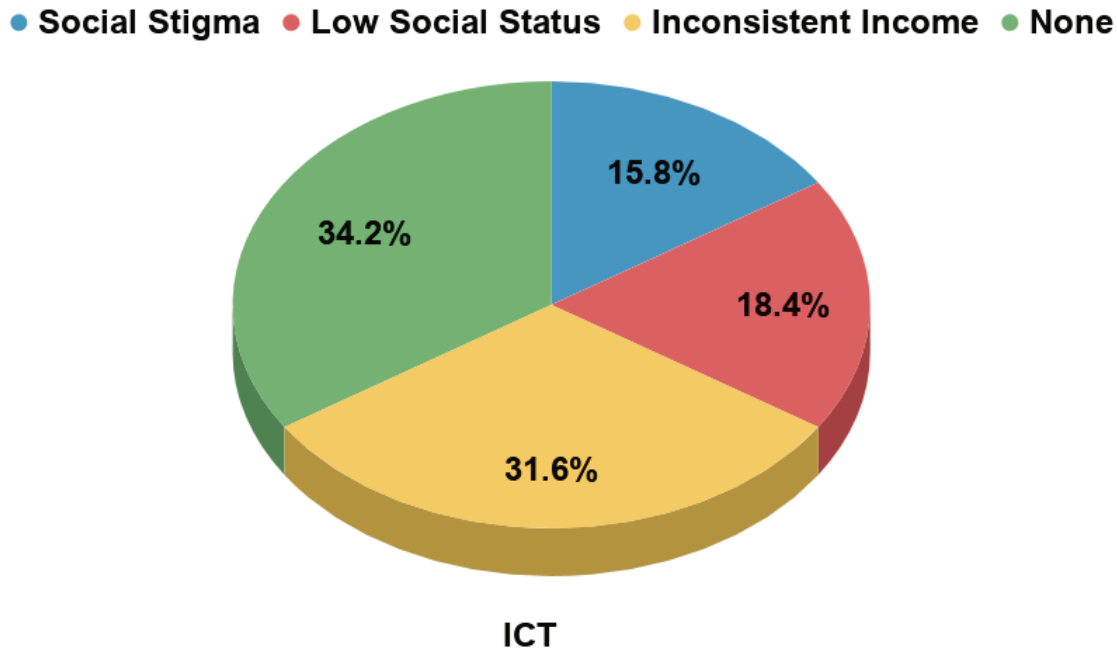



Figure 29: Problems reported by scavengers / MCI workers

## 4.2.6 Solutions proposed by scavengers / MCI workers

Figure 30 represents solutions that were suggested by waste pickers to address the issues that they face. Informal waste pickers consider alternative employment opportunities as the biggest step that can be taken for their uplift. It has been observed that many informal waste pickers in ICT are refugees from **Afghanistan** and hence lack citizenship rights and have highly precarious socio-economic conditions. One of the respondents suggested that legislative reforms to provide citizenship to these refuges and to protect the rights and livelihood of the informal waste pickers are essential. This is also necessary in the context of interaction between police officials and waste pickers as the legal approval of waste pickers' work is unclear to both parties.

Formal sector waste pickers report that they should be paid **higher wages** and have **better occupational health and safety measures in place**. Moreover, formal sector waste pickers also suggested that the number of sanitary workers should be increased as they feel that the current number is insufficient to manage the waste of ICT under the assigned working hours. However, as inconsistent income is reported by most scavengers and **formalization of the informal waste pickers** will ensure contracts and agreements with waste buyers. Public campaigns should also be initiated to curb the issue of stigmatization of occupations related to waste.

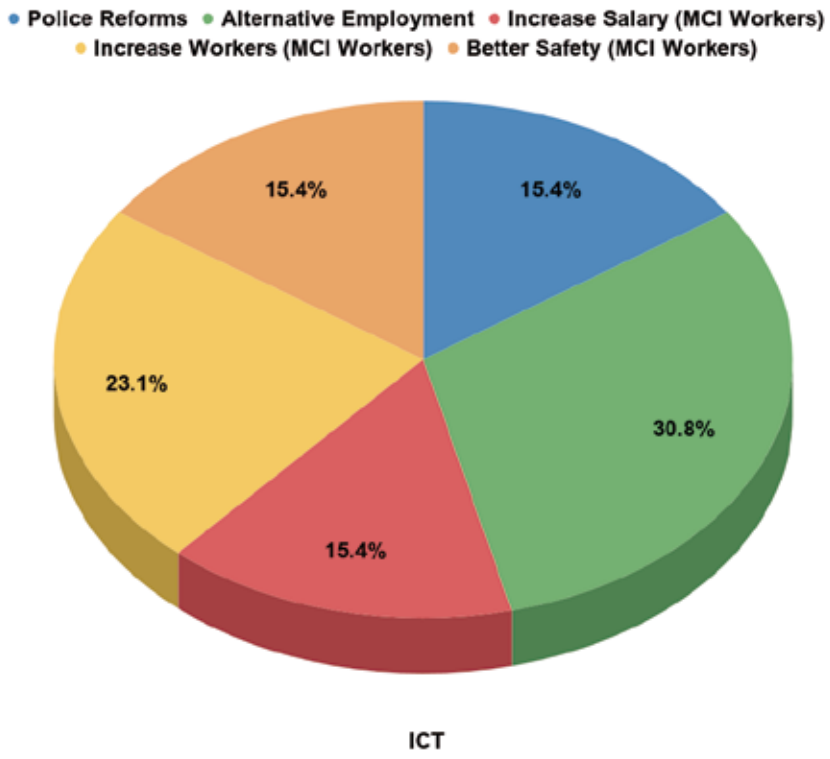



Figure 30: Solutions proposed by scavengers / MCI workers

### 4.2.7 Segregation trend in commercial entities of ICT

Figure 31 represents the segregation pattern that was analyzed through the commercial and hospital based questionnaires. As can be observed from the figure almost **74.2%** of respondents claimed that segregation was an alien concept. Only **25.8%** of respondents confirmed that they practiced segregation at source. During interviews, however, they conveyed their concerns regarding the management of segregated waste by authorities. They believed that their segregation efforts were in vain as there was no proper utilization of the segregated waste by authorities. They concluded that until and unless people are not incentivized to segregate waste no progress can be made in this regard.

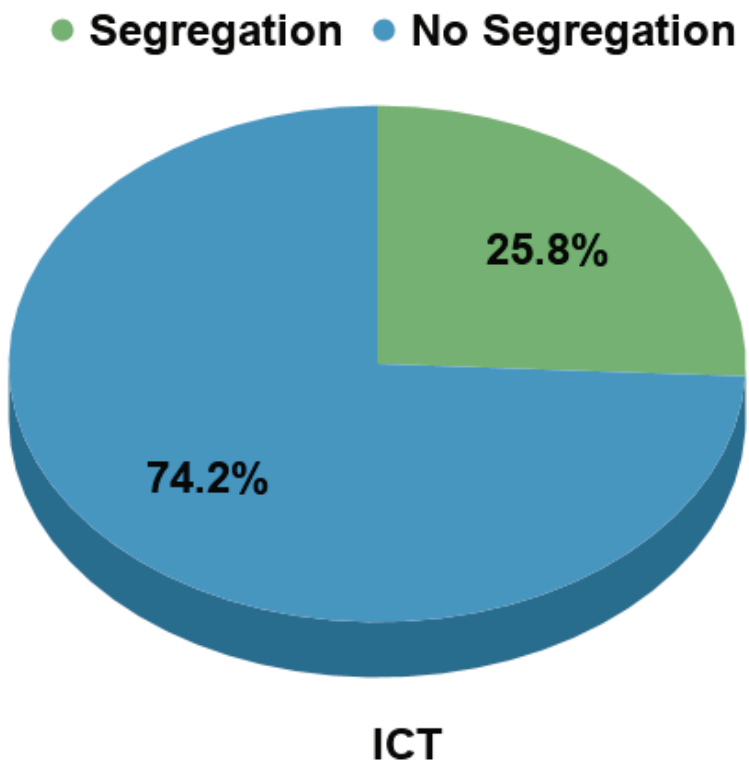



Figure 31: Segregation trend in commercial entities of ICT

## 4.2.8 Gender and age trend in the scavenging / MCI community in ICT

Figure 32 depicts the gender and age trend extracted from the responses undertaken through the interviews and questionnaires collected from scavengers and MCI workers. On average, each respondent claimed to have around eight family members out of which four work in the informal waste sector. Out of these four members, at least two are adult males, while one in every two respondents claimed to have a woman family member working in the informal waste sector. None of the respondents reported to have any third gender members of family (if any) involved in the informal waste sector.

On average, all the respondents claimed to have one child from their family involved in the waste collection circle. However, there were doubts on the veracity of the response received on the subject of the involvement of children, as it was believed that the respondents engineered their answer. This assumption is based on the overtly uncomfortable demeanour of the respondents while discussing this matter. Therefore, it can be deduced that the number of children involved is relatively higher than what the representation in the figure depicts.

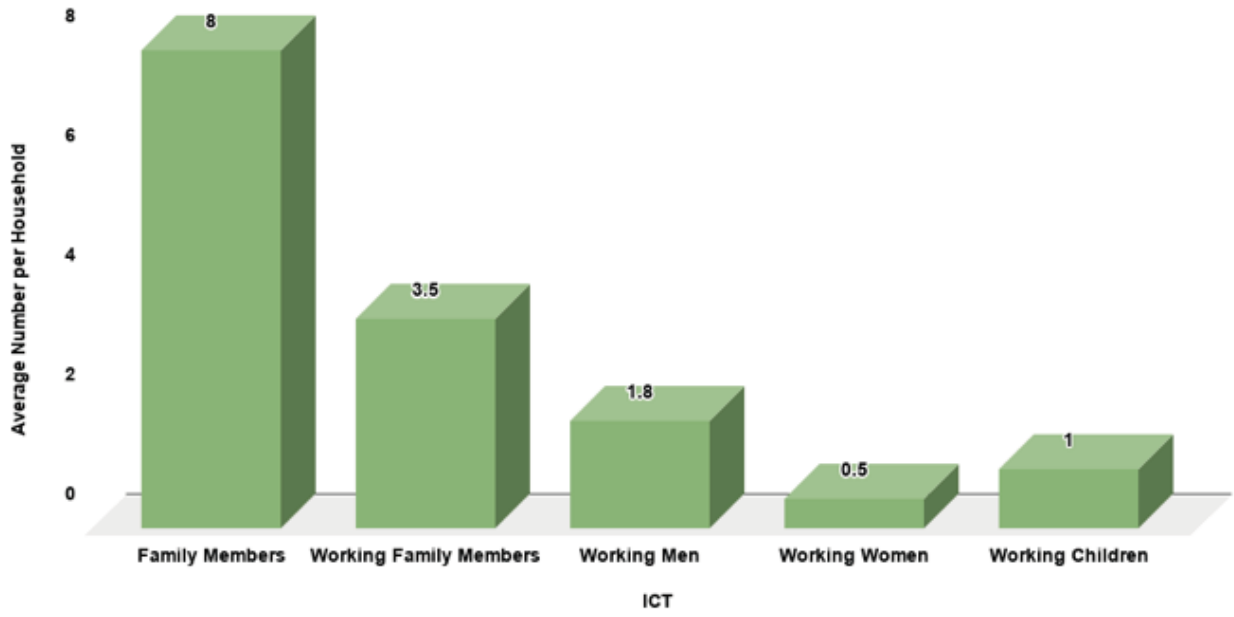



Figure 32: Gender and age trend in scavenging / MCI community of ICT

### 4.2.9 Awareness level among indirect and direct manufacturers

A manufacturer of HDPE was approached in Rawat (rural ICT), and it was reported that monthly production of HDPE was approximately **3,500 tons/month**. It was assessed that the manufacturer was aware of the environmental hazards posed by production and post-consumer disposal of plastic products. On further discussion, the authorities showed their approval of shifting to more environmentally sound technologies, provided that their financial foundation, progress and production rates in general are not hindered. The authorities were also found to be aware of eco-friendly plastic products and showed signs of adopting this technology, provided the aforementioned concerns are catered to accordingly.

Two indirect manufacturers were visited in urban Islamabad in order to ascertain their narrative towards eco-friendly plastic products. Indirect manufacturers were defined as large scale retail outlets that produce a considerable amount of single-use plastic waste that is either directly produced by them or is procured from an external vendor. One of the respondents reported to use **7-10 kg / month** of LDPE made shopping bags. The same respondent was reported to be aware of alternatives and was also open to the idea of adopting these alternative provided they serve.

The second respondent was reported to generate approximately **1,000 units of straws,** and **1,000-1,500 units of polystyrene** items on a monthly basis. On further discussion, it was assessed that the respondent was unaware of environmentally friendly alternatives . However, the respondent welcomed the idea of eco-friendly plastic products once he got the gist of it.

**3,500 tons/month**
monthly production of HDPE

**7-10 kg/month**
monthly production of LDPE

**The second respondent was reported to generate approximately 1,000 units of straws, and 1,000-1,500 units of polystyrene items on a monthly basis.**

## 4.2.10 Recyclers: financial and recycling potential

Three recyclers were approached in ICT while none were approached in ANP owing to their unavailability. From the three surveyed, two were situated in sector I, while one was based in Rawat. All three respondents disposed of unused items in different ways; one sold unused items to brick kilns and another dumped unused items randomly. All three procured their raw material from a network of junk dealers based in ICT and the nearby areas. They did not buy it directly from scavengers. The responses with respect to recycling of plastics are as follows:

### 4.2.10.1 Recycling of PET

Only one recycler out of the three surveyed procured PET for recycling; he reported to buy around **15,000 kg of PET** per month at a rate of **PKR 55/kg**. End products created after the recycling of PET were sandals, granules and food containers.

### 4.2.10.2 Recycling of HDPE

Two recyclers out of the three surveyed procured HDPE for recycling; one among them reported to buy around **45,000 kg per month** at a buying rate of **PKR 40/kg**. The other respondent reported to buy around **1,600 kg/month** at a buying rate of **PKR 45/kg**. Syrup bottles, food containers and roll pipes were the end products.

### 4.2.10.3 Recycling of PP

Only one recycler of the three surveyed procured PP for recycling; he reported buying around **4,500 kg of PP per month** at a rate of **PKR 55/kg**. There was no information on the end product made after the recycling process.

### 4.2.10.4 Recycling of PVC

Only one recycler out of the three surveyed procured PVC for recycling; he reported buying around **100 kg of PVC per month** at a rate of **PKR 55/kg**. The end product created after the recycling process was roll pipes.

### 4.2.10.5 Recycling of LDPE

Only one recycler out of three surveyed procured LDPE for recycling; he reported to buy around **15,000 kg of LDPE per month** at an undisclosed rate. The end product created after the recycling process were polythene bags.

## 4.3 RESULTS FROM INTERVIEWS AND QUESTIONNAIRES ADMINISTERED IN ANP

### 4.3.1 Characterization of generation pattern in ANP

In a similar fashion to the characterization of generation patterns in ICT, the Figure 33 is projected by analyzing the generation pattern of the following stakeholders: households, shops, hotels, schools, government offices, malls /markets, and restaurants. These highlighted stakeholders are the sources of plastic pollution in the environment and therefore the analysis of their generation pattern holds immense importance. The representations shown in Figure 33 depict the percentage of stakeholders that use the various plastic types as well as those who do not consume them.

In interviews and questionnaires administered, respondents who replied in affirmation for a certain type were also asked about their approximate consumption pattern in terms of units used per month.

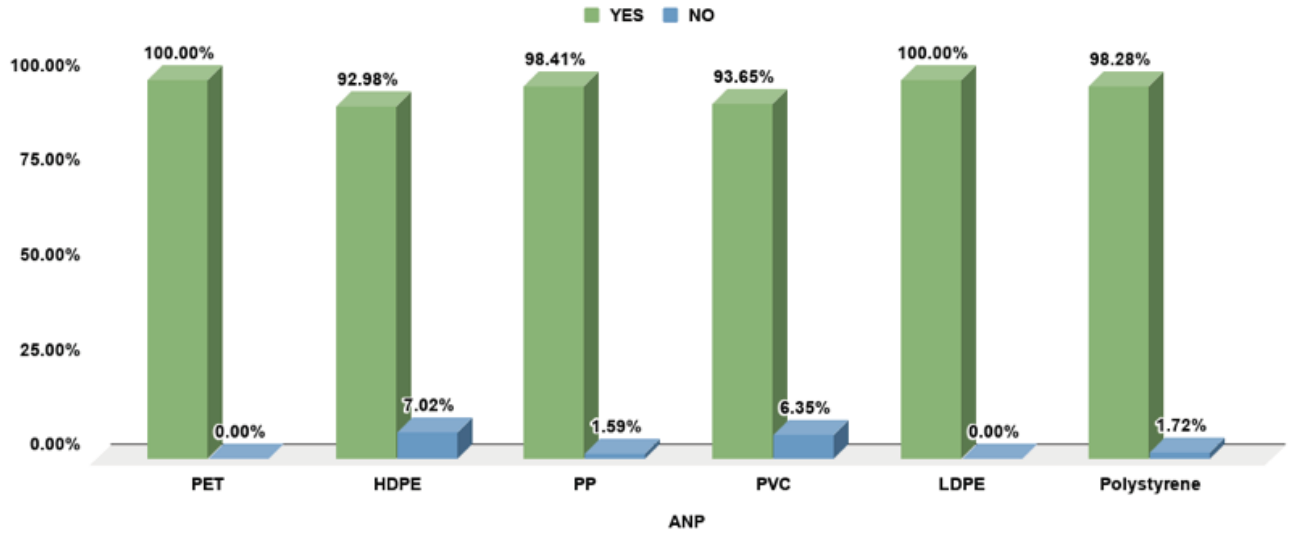



Figure 33: Characterization of the generation pattern in ANP

### 4.3.2 Analysis of formal collection

The formal waste management authority responsible for the waste management of ANP and its peripheries is the GDA. The GDA is the government department prescribed the responsibility of sanitary work in and around the ANP area.[9] During the summer, the GDA collects waste on a daily basis from residential places and hotels. Unfortunately, authorities have no proper disposal mechanism for solid waste and there is mostly open dumping of waste in ANP. WWF-Pakistan, while conducting an earlier study found that solid waste collected was thrown along the roadsides of the park.[10] In 2016, the Khyber Pakhtunkhwa government initiated reforms for waste collection to include solid waste dumping grounds at tehsil levels and collections points at village/neighbourhood council level as well as promulgating new laws such as the GDA Act 2016.[11] However, disposal of garbage by tossing it across the fence or the slope continues to be a common practice. There is rampant open dumping in Nathiagali (part of the ANP area).

[9] http://gda.gkp.pk/services/
[10] http://lib.icimod.org/record/11958/files/1288.pdf
[11] http://lgkp.gov.pk/ongoing-reform-initiatives/

The respondent from GDA intimated that approximately 6.5 tons of waste is generated in ANP on a daily basis. According to the respondent, the collection efficiency is approximately 80%. When asked about the areas of improvement, he commented that the leading issues faced in waste collection currently are: lack of awareness of the tourists regarding sustainable disposal of waste and lack of resources (to some extent).

### 4.3.3 Quantities of plastic waste types reported by informal waste collectors

Figure 34 represents the analysis of the information received from the informal sector with regards to the types of plastic collected, purchased and sold. The respondents include junk dealers, municipal workers, and scavengers. Although municipal workers fall under the formal waste system because they also partake in scavenging their responses have also been included in order to ascertain the trend. As can be observed from Figure 34, PET was found to be the most profitable item on their list and therefore respondents from the informal waste sector reported to collect PET. An almost similar trend is observed in the case of HDPE and PVC. This trend also explains and justifies the relatively low percentage of PET, HDPE and PVC found in the waste streams of ICT.

Scavenging is mainly carried out in the early hours of the day before waste collecting authorities start their day-to-day operations. They usually head to waste collection sites/skips and first assess the top of the skip in order to see the types of waste present. They then scrutinize and segregate the recyclable waste from the top surface, eventually making their way towards the middle. During this exercise scavengers end up littering the area around the skip with unused waste. The unused waste is unaccounted for and also ends up littering the environment.

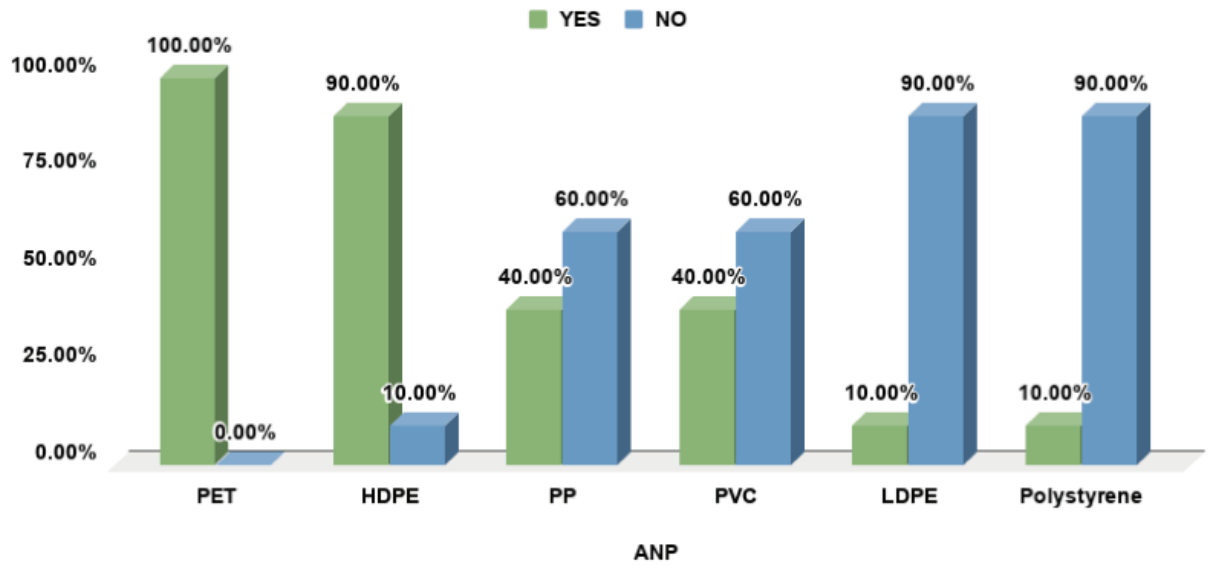



Figure 34: Quantities of plastic waste types reported by informal waste collectors

Figure 35 represents a similar trend to ICT. On average, for scavengers and MCI workers, **PET** is the most sought after post-consumer plastic waste type followed by HDPE even in ANP.

In contrast to ICT, on average **PVC** is the most sought after post-consumer plastic waste type followed by HDPE for junk dealers in ANP, as represented in Figure 36.

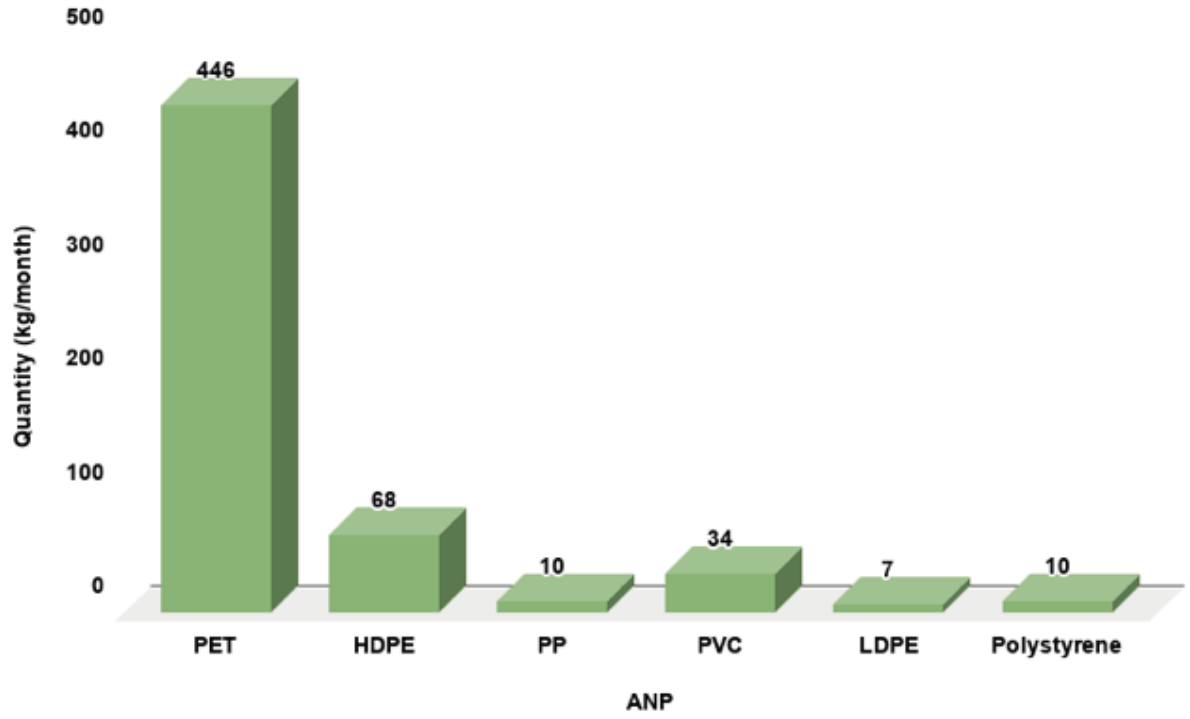



Figure 35: Average quantity of plastic waste per scavenger

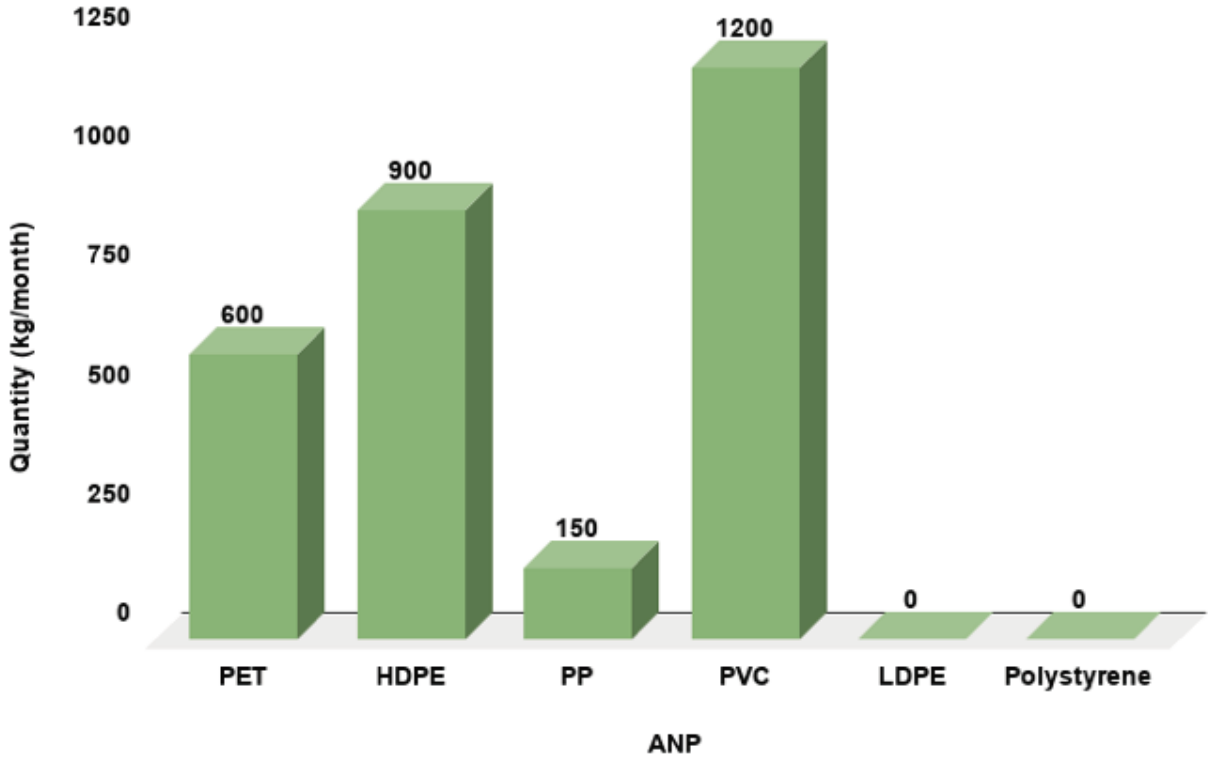



Figure 36: Average quantity of plastic waste per junk dealer

### 4.3.4 Sources of waste for scavengers in ANP

The collection trends of scavengers was observed in ANP. It was found that all sources of scavenging are in commercial areas and open dumpsites.

### 4.3.5 Segregation trend in commercial entities of ANP

Figure 37 represents the segregation pattern that was analyzed through commercial and hospital based questionnaires. As can be observed from Figure 37 almost **70.6%** of respondents claimed that segregation was an alien concept. Only **29.4%** of respondents confirmed that they practiced segregation at source.

During interviews, however, respondents conveyed their concerns regarding the management of segregated waste by authorities. They believed that their segregation efforts were in vain as there was no proper utilization of the segregated waste, they concluded that until and unless people are not incentivized to segregate their wastes no progress can be made in this regard.

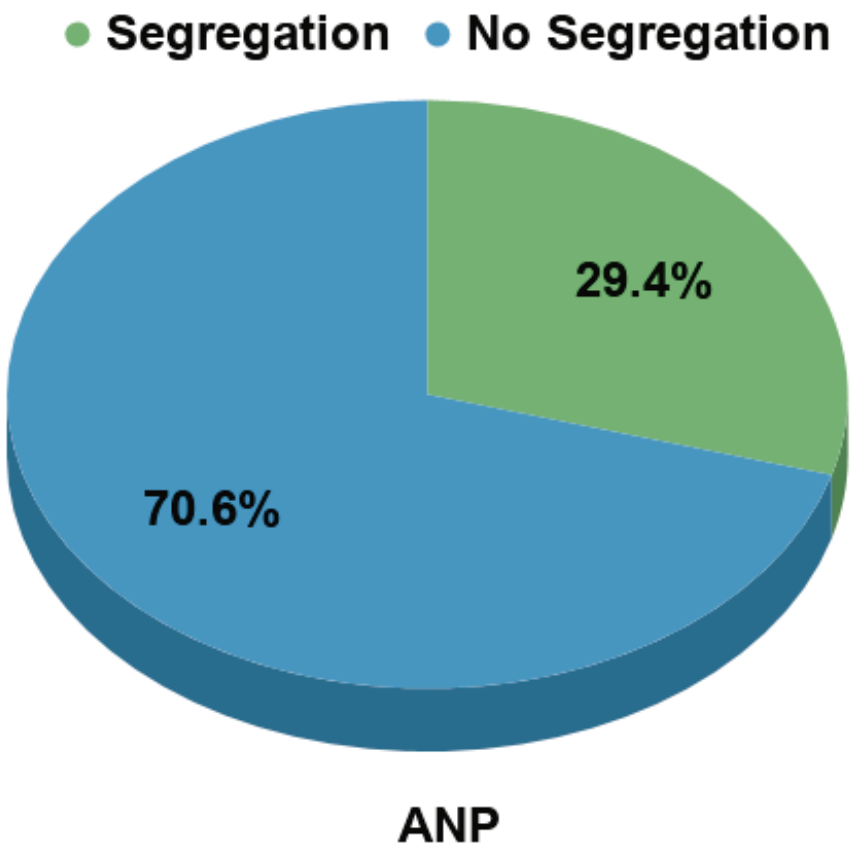



Figure 37: Segregation trend in commercial entities of ANP

### 4.3.6 Gender and age trend in scavenging / MCI community of ANP

Figure 38 illustrates the average of all the responses undertaken through the interviews and questionnaires administered to scavengers and MCI workers. On average, each respondent claimed to have around eight family members out of which two work in the informal waste sector. Out of these two working members, both are adult men with some cases where children were reported to work as scavengers. However, there were doubts on the veracity of responses received on the subject of the involvement of women. It is believed that the respondents engineered their answers. This assumption is based on the general sensitivity and overtly uncomfortable demeanour of the respondents while discussing this matter. Therefore, it can be deduced that the number of children involved is relatively higher than what the representation in Figure 38 depicts.

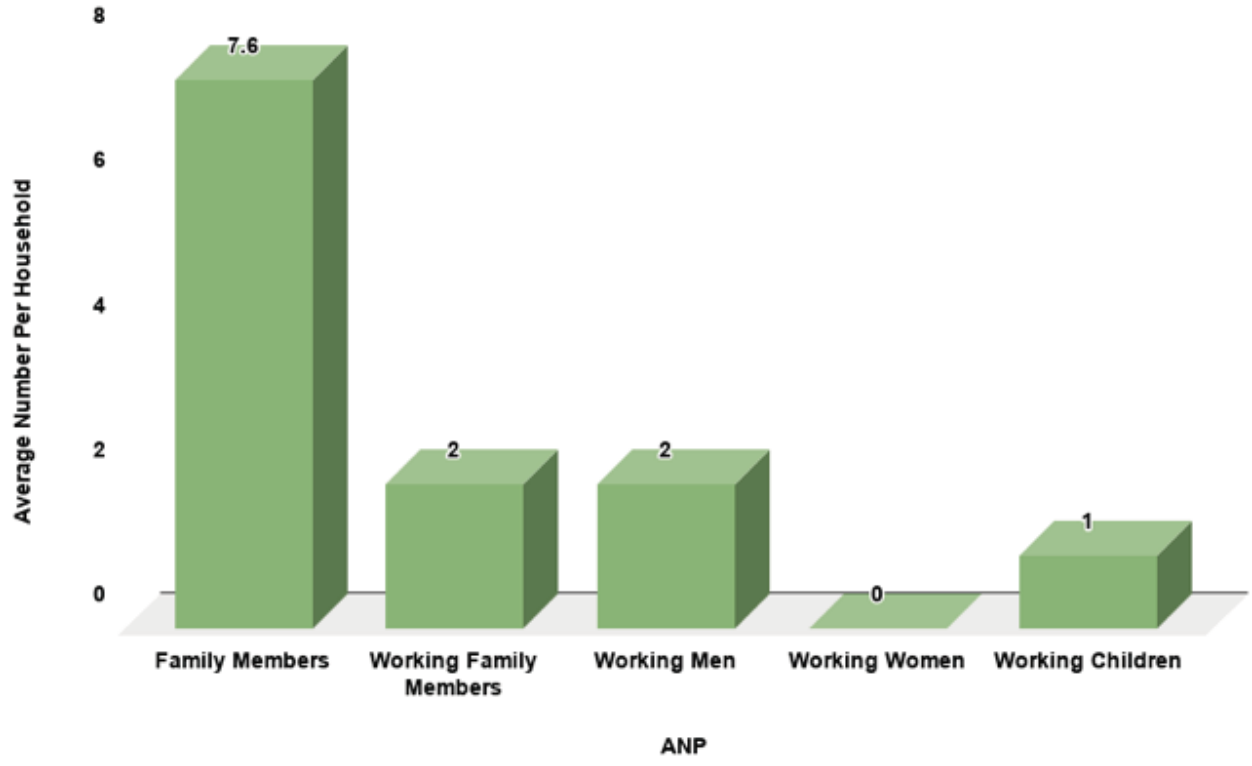



Figure 38: Gender and age trend in scavenging / MCI community of ANP

# CONSTRAINTS

In the course of conducting this study, several constraints were encountered. The biggest challenge was that of time. Although, a one-month long period for field observations/waste sampling provided enough samples to gather daily, weekly and monthly statistics for plastic waste generation and characterization in ICT, there was little time for contact establishment with significant gatekeepers including administrative authorities of CDA, MCI, private waste management companies, hospitals, schools, shopping malls, government offices and so on. Therefore, waste sampling and contact establishment were carried out simultaneously during the first week. During this period, field officers were not certain about their waste sampling points and had to explore one option after another depending on approval of access by administrative authorities for various stakeholders. Similarly, interviews were conducted in the first week with some difficulty. Moreover, interviews and questionnaires and waste sampling had different kinds of constraints, which are mentioned below:

**In some areas, people were unwilling to provide any information, mistaking the field officers for tax officers.**

The foremost **constraint faced during interviews** was the lack of compiled data about residential, commercial and public sector units in ICT and ANP. As a result, it was not possible to find some unit types in areas where a section of the sample was pre-assigned under that unit type. This was prominently the case for residential units in I-11. In E-7 there were fewer residential units as well as commercial units than expected. In some areas, people were unwilling to provide any information, mistaking the field officers for tax officers, despite the fact that prepared and standardized introductions in the Urdu language were used. Moreover, a language barrier was also encountered in a number of cases as it was not possible to translate questionnaires into several languages spoken in ICT and ANP areas.

**The biggest constraint faced during waste sampling was that of timing**. The timing of observations determined the availability of representative samples of waste generation in several areas. This was almost universally true for residential and commercial areas as PET bottles were segregated and collected by waste pickers around 6:00 to 7:00 AM from residential and commercial waste collection points. The CDA and MCI authorities were informed about the timings of waste sampling and they cooperated by pausing the transfer of waste from collection points until field officers conducted waste sampling observations. However, in Bani Gala sanitation authorities were not able to cooperate due to the proximity of the Prime Minister's residence. Similarly, only some hospitals provided waste sampling as others including the BHU in Jagiot and Shifa Hospital reported that they disposed of their waste within the day that it is produced. Some stakeholders did not provide access for waste sampling. These included one higher educational institution, one school, two hospitals and a number of factories.

## Moreover, sample waste was found with difficulty in many areas where waste collection was not practiced and where the MCI did not have any presence.

This was true for some rural areas including Jagiot and Nilore. Moreover, in Jagiot and Nilore, waste was sometimes burnt and surveyors had to find alternative sites for waste sampling. Mohri Khumbal was inaccessible due to its precarious road and it was not possible to sample waste there as the waste was being burnt. Another problem was that of the unavailability of helpers from CDA and/or MCI. Labourers were therefore hired on a daily basis to assist the surveyor in sorting and weighing of the waste. Therefore, it was judged as inappropriate for the study. The MCI and CDA provided cooperation, however, it had become a source of inconvenience for them as their waste collection and transportation was interrupted. The workers provided their labour pro bono but were tired of the additional work towards the end of the study.

# CONCLUSION AND DISCUSSION

The findings of the baseline study for characterization of plastic waste indicate that all income groups indeed play a participatory role in plastic use and disposal in varying capacities. The types of plastic waste these groups generate range from, but are not limited to, plastic bags used for groceries to household consumer items by both lower and middle income groups. Other than the day-to-day plastic items such as PET bottles, PP bags, middle to higher income groups in societies purchase additional products with some form of plastic composition, such as mobile pouches, plastic utensils and plastic containers for storing food stuff etc. Similarly, students from all tiers of society generate plastic wrappers from crisps, geometry boxes made of plastic etc.[12] In the same manner, all commercial stakeholders such as hospitals, factories, markets, and hotels produce considerably large amounts of LDPE, PET, PP and PVC-based waste items throughout the year.

It is also pertinent to mention that in ICT, the percentage of plastic waste in waste streams on weekdays is relatively more than on weekends. This can be attributed to various reasons: ICT constitutes the capital area of Pakistan, and therefore, is home to a lot of hustle and bustle during the weekdays owing to the proceedings in the commercial sectors such as government and private offices, schools, as well as markets and malls.

On the contrary, the findings elucidate a different picture for ANP. The percentage of plastic waste in waste streams on weekends outweigh that on weekdays. The area is a popular tourist spot with mammoth footfall throughout the year. The influx of tourists is at its peak on weekends, therefore, the overall waste generation as well as the quantity of plastic waste generated increase significantly on weekends.

## Plastic Waste Percentages

**48.56%**
**ANP**

**14.26%**
**ICT**

Another important finding is the difference in the overall plastic waste percentage found in the waste streams of ICT and ANP. It is far greater in the latter (48.56 %) as compared to the former (14.26 %). The reason for such a considerable difference can be attributed to the intermittence of the residing population in ANP. Tourists in large numbers visit ANP for a short period of time, hence, use a lot of single-use items constituting of almost all plastic types identified especially PET and LDPE. On the other hand, in ICT due to permanent settlements, reliance on single-use plastic items is comparatively less. However, a large amount of organic, construction and other forms of waste is generated. Due to this fundamental reason, the percentage of plastic waste in waste streams of ANP was found to be far greater than in ICT.

[12] https://tribune.com.pk/story/1732444/6-plastic-pollution-pakistan-opinion/

Waste management authorities of both ICT and ANP **reported a collection efficiency of 80%.** In urban ICT, CDA is responsible for both primary and secondary collection. Waste collected from dumpsters is directly taken to the I-12 dumpsite, which is the official dumping area designated for ICT. In most of rural ICT, however, CDA has only provided secondary collection and therefore a lot of waste generated goes unaccounted for, i.e. some of it does not reach the official dumpsite. As a result, open burning was observed in areas that are inaccessible for primary waste collection by relevant bodies. On the other hand, GDA provides a secondary collection facility in ANP as collected waste is directly transported to a dumping site in Abbotabad.

## 6.1 FORMALIZING THE INFORMAL SECTOR

In both ICT and ANP, scavenging was observed to be a common and recurring practice. Scavengers reported to amass almost all recyclable items (mostly PET and HDPE) and sold them to various junk dealers in accordance with the highest bid. Each junk dealer's shop has its own fixed number of scavengers who are commissioned to collect/purchase the discarded material/junk on a daily basis. These scavengers are, hence, an important part in the supply chain of the informal sector.

Most of the scavengers are Afghan migrants, who sort and segregate waste in separate bags for their contractor who hires their services at cheap rates. These scavengers usually concentrate on collection of paper, plastic material, glass and ceramics, and metal as it is of higher monetary value.

In some of the best practices around the world, it has been noted that organizing and training informal recyclers into small and medium enterprises is a very effective way to upgrade their ability to add value to collected materials, thereby improving their livelihoods as well as waste collection mechanisms. In light of the issues identified by scavengers interviewed as part of this study, it is suggested that a proper mechanism must be established to incorporate these scavengers into the formal waste management stream. The government should pave way for the registration of these scavengers, who lack citizenship rights. Once they are registered, a mechanism to incorporate them into the formal channel can then be put in place. This will ensure a steady income for them, improve their livelihoods, as well as improve the quality of the waste collection as well as the quality of the waste collected.

### CASE STUDY: NEW DELHI, 2010

A successful case study in this regard is that of New Delhi, India, where waste collectors were formalized in 2010. This policy change yielded cost-effective and high collection-efficiency results.[13] The New Delhi Municipal Council instituted a legally recognized door-to-door collection system, which provided livelihoods to informal sector entrepreneurs. Residents were charged a nominal fee for daily collection of their solid waste. Waste pickers organized under NGOs were issued uniforms and identity cards, which established their right as waste collectors. They were provided a rickshaw for collection and space for segregation. The informal sector in this way provided the segregation as well as a primary collection service and delivery of waste to communal bins.

[13] https://thecitywasteproject.files.wordpress.com/2013/03/solid_waste_management_in_the_worlds-cities.pdf

Similarly even in Pakistan, the informal sector plays a key role in the collection of recyclables. Therefore, it is essential to apply the same model in big regions/cities of Pakistan such as ICT in order to establish a successful recycling model.

**For areas such as ANP, which grew from small settlements to become a big tourist hub and is essentially unplanned and expansive, integrating waste pickers into the formal sector would be more challenging.**

Hence, an incremental solution would be more effective. As a first step, trainings can be provided to informal waste pickers on health and safety, waste handling as well as ways to maximize waste collection. Awareness sessions with a feedback component can also be held to understand the nature of problems faced by the informal waste sector.

**95%**

**purity is essential, for certain types of plastic, to be suitable for remodeling.**

The formalization of the informal waste sector and segregation at source will also help reduce contamination, which is one of the major problems associated with the collection of post-consumer plastic waste. Contaminants may remain in plastic even after the reprocessing stage.[14] This promotes rejection of recycled plastic due to deterioration of material properties, and hence restricts the use of recycled plastic content in new products. This is problematic for certain types of plastic, where at least 95% of purity is essential to be suitable for remolding, such as HDPE, PE and PP.[15]

Therefore, in order for the model to be financially feasible, contamination of post-plastics also have to be mitigated.

## 6.2 RECYCLING POTENTIAL AND FEASIBILITY

Apart from an Integrated Resource Recovery Centre established in G-15 with the financial assistance of UN-Habitat and UNESCAP, which deals predominantly with compostable waste, there is no medium to large scale mechanism present in Islamabad and ANP to deal with solid waste management, let alone its recycling.[16] Many of the recyclers present in the concerned areas are unregistered and therefore a specific number of recyclers cannot be reported. The same case applies to the number of scavengers and junk dealers present across the two regions.

[14] https://www.sciencedirect.com/science/article/pii/S030438941730763X

[15] https://doi.org/10.1002/masy.19920570111

[16] https://www.unescap.org/sites/default/files/Session2-1-Regional%20Workshop%20Presentation_GUL.pdf

Generally, plastic that is collected for recycling is reduced to **resin or pellets.** However, most high-quality plastic manufacturers in Pakistan use imported resin and pellets because those produced locally from recycled materials are contaminated from garbage with decomposing food and soiled items, such as diapers.[17] This also serves as one of the reasons of hesitation by manufacturers to rebuy their used single-use products from scavenger/junk dealers.

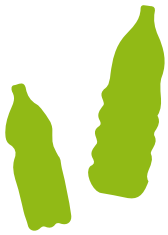
## Some of the plastic products that are produced by recycling and plastic crushing facilities are used as raw materials in the making of other plastic goods.[18]

Keeping in view the amount of PET and HDPE waste generated overall, it is suggested that they are the most feasible plastic waste type that may be considered for recycling. LDPE is also available in huge numbers but because the scope of its recycling is comparatively less, an investment in it is not suggested. Also, with the recent governmental ban in place, its consumption is expected to regress considerably in future.[19]

PET is generally bought by recyclers at an approximate rate of PKR 55/ kg while HDPE is generally bought at a rate ranging from PKR 40-45/ kg. Therefore, it is safe to suggest that under the current status quo, recycling of post-consumer PET and HDPE is financially and practically the most feasible option.

It is pertinent to mention here that the system of collection of post-consumer PET and HDPE is already in place in the form of scavengers and junk dealers. More so, the market demand of the end product of their recycling is also significant, as observed from interviews and questionnaires administered to the recyclers. As per the trend observed over the course of the study, PET is generally bought by recyclers at an approximate rate of PKR 55/ kg while HDPE is generally bought at a rate ranging from PKR 40-45/ kg. Therefore, it is safe to suggest that under the current status quo, recycling of post-consumer PET and HDPE is financially and practically the most feasible option, provided that the aforementioned recommendations are followed.

Figure 39: Sorting of different types of plastics from B-17's commercial waste sample



[17] https://www.dawn.com/news/1505436

[18] http://www.sbp.org.pk/departments/ihfd/Sub-Segment%20Booklets/Plastic%20Products.pdf

[19] https://www.theguardian.com/global-development/2019/aug/23/pakistan-expands-ban-plastic-bags

## The following pre-requisites ought to be kept in mind while establishing a financially and environmentally viable recycling facility and/or upgrading already present recycling facilities:

i. Existing recyclers should be registered so that they can be regulated, their progress can be monitored and compliance to environmental standards can be ensured.

ii. Workers employed in the recycling facility should be provided personal protective equipment as they frequently deal with potentially hazardous materials.

iii. The recycling facility should be planned according to the characteristics of the recyclable material. For example, a volume reduction facility (crusher), which uses heat to decrease the amount of recyclable plastic, or a compression facility designed to manage PET plastic, will be most appropriate in dealing with plastics related to recycling.[20]

iv. A mechanism for segregating and handling dust generated from facilities for input, sorting, crushing (shattering), compression etc must be in place.[21] This will help reduce the negative externalities associated with dust pollution.

v. The recycling facility should ideally be established in near proximity to the dumping site of ICT, i.e. within a radius of 10-15 km. This will reduce travel time and also travel cost, increasing the financial viability of the recycling facility.

vi. Outsourcing the supply of raw material (post-consumer plastic waste) to an external party ensures constant inflow. A private vendor who could formalize scavengers and junk dealers in order to ensure environmental and social compliance would be a reasonable option.

vii. The composition of each type of waste is not uniform, bags will have varying LDPE percentages; and it is the same case with PET. Therefore, it can be concluded that separate recycling plants and specific machinery are required for each type of plastic type.

viii. The facility should rely on labour intensive methods since labour in Pakistan is cheap and readily available. The shortcomings associated with manual labour can be mitigated through pre education on sorting related work. This can also be mitigated by formalizing the informal waste sector as previously suggested.

Once the recycling facility has been established keeping the aforementioned pointers in view, recycling and financial feasibility can further be increased if certain best practices are adopted. For instance transitioning to automated sorting of recyclables through conveyor belts.

[20] http://uu.urbanunit.gov.pk/Documents/Publications/0/48.pdf
[21] http://uu.urbanunit.gov.pk/Documents/Publications/0/48.pdf

# RECOMMENDATIONS

The results extracted from the study reveal a lot of challenges and gaps that need to be addressed in order to establish a sustainable circular economy model of post-consumer plastic waste. The following recommendations need to be implemented in order to achieve the desired results:

## FORMALIZATION OF THE INFORMAL WASTE SECTOR

Scavengers should be registered in order to legally remove child labour. This will not only catalyze their formalization in the waste sector but will also safeguard their social and economic rights thus mitigating the trust deficit that exists between them and the authorities.

## MOBILIZATION OF INFORMAL SECTOR

The formal sector should mobilize the informal sector and conduct periodic trainings of both the scavenging community and the junk dealers on themes ranging from safety and health to environmental compliance. This step will educate the informal sector regarding ongoing best practices in the world and as a consequence will improve the overall efficiency and output of the post-consumer plastic waste circular system.

## REGISTRATION OF RECYCLERS

All unregistered recyclers ought to be formally registered. This will enable authorities to keep tabs on their activities, regulate the quantity and quality of the supply and demand of plastics and will also give them the prerogative to take action against non-conformers.

## NO OBJECTIFICATION CERTIFICATES TO BEST PERFORMERS

All unregistered recyclers ought to be formally registered. This will allow authorities to keep tabs on their activities, regulate the quantity and quality of the supply and demand of plastics and will also give them the prerogative to take action against the non-conformers.

## CENTRALIZED PLASTIC RECOVERY SYSTEM

A centralized plastic recovery system, such as a reverse vending machine, should be set up by the government in the major commercial areas of ICT and ANP, as well as all other major cities of Pakistan. This initiative will provide a platform for the up-cycling of reusable plastic waste. The collection points should be established solely to collect plastic waste. This action, if taken, will not only sensitize the general populace about responsible consumption but will also give them an opportunity to actively engage in responsible disposal of plastic waste. This facility can be established by taking civil society as well as the corporate sector (manufacturers of plastic) on board.

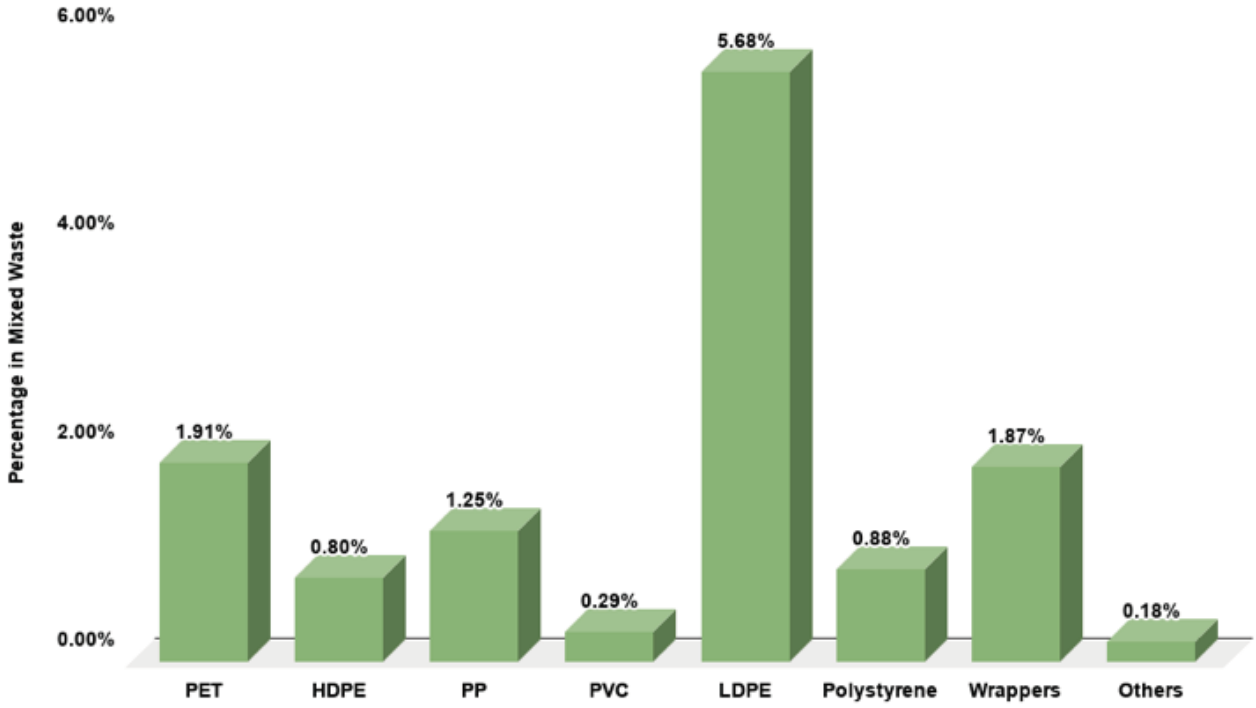
## FUTURE RESEARCH AND STUDIES

For similar future projects and studies, a participatory development approach ought to be followed to ensure that the voice of the most marginalized and vulnerable groups like waste pickers is included. In addition, research on estimation of quantities and characterization of plastic waste in other cities of Pakistan also needs to be conducted, so the potential of plastic recycling can be explored at a larger scale. Research should also be conducted on alternates to packaging especially multi-layered packaging (e.g wrappers), so that they are completely recyclable.

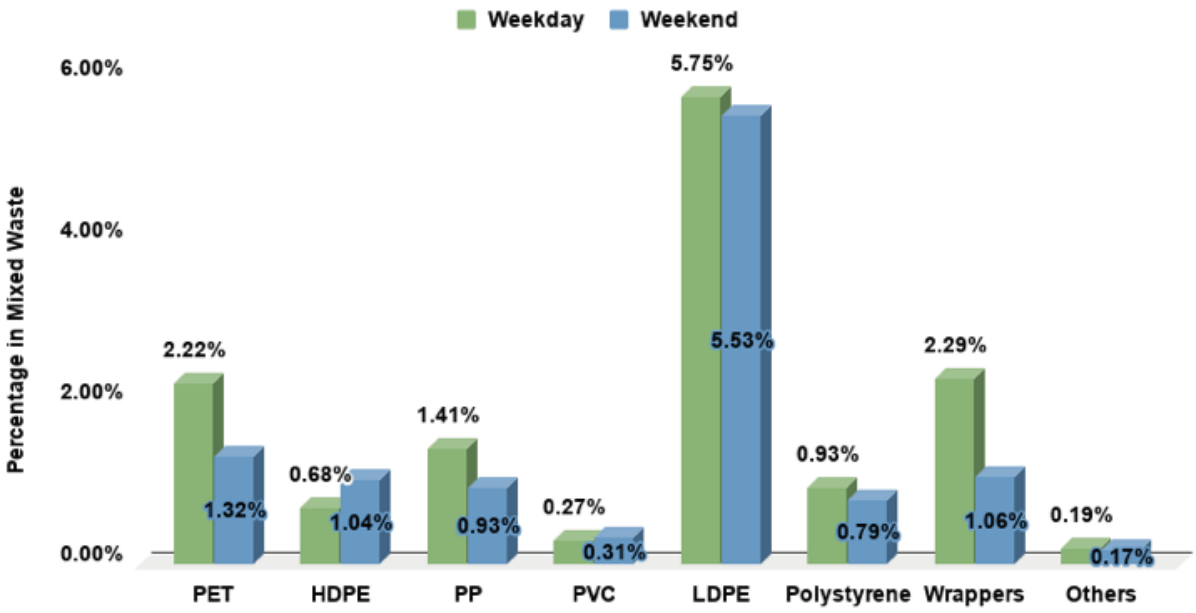
## PUBLIC ENVIRONMENTAL AWARENESS

Steps should be taken to encourage various stakeholders to segregate waste at source. Communication mediums such as electronic and print media should also be utilized to sensitize the public about issues and impacts associated with plastic pollution. This should be followed by individual and collective level solutions that address the highlighted issues and impacts. Additionally, since a considerable amount of the population is active social media users, dedicated social media campaigns in collaboration with civil society can be a favourable option in this regard.

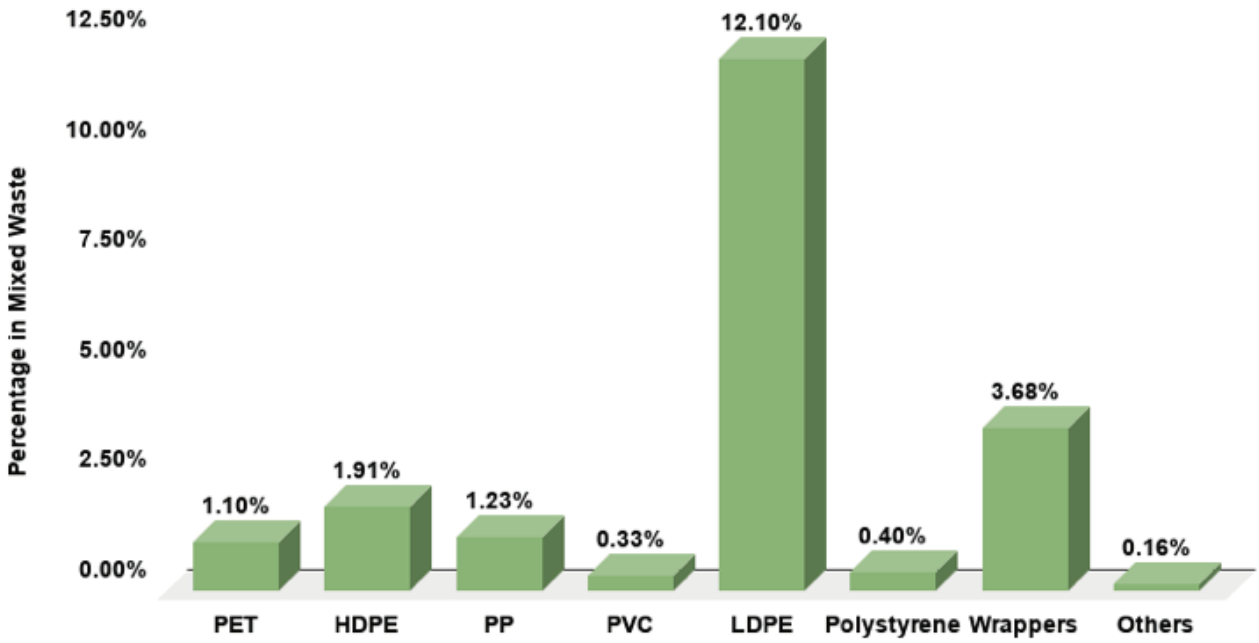
# ANNEXURE I
# GRAPHS



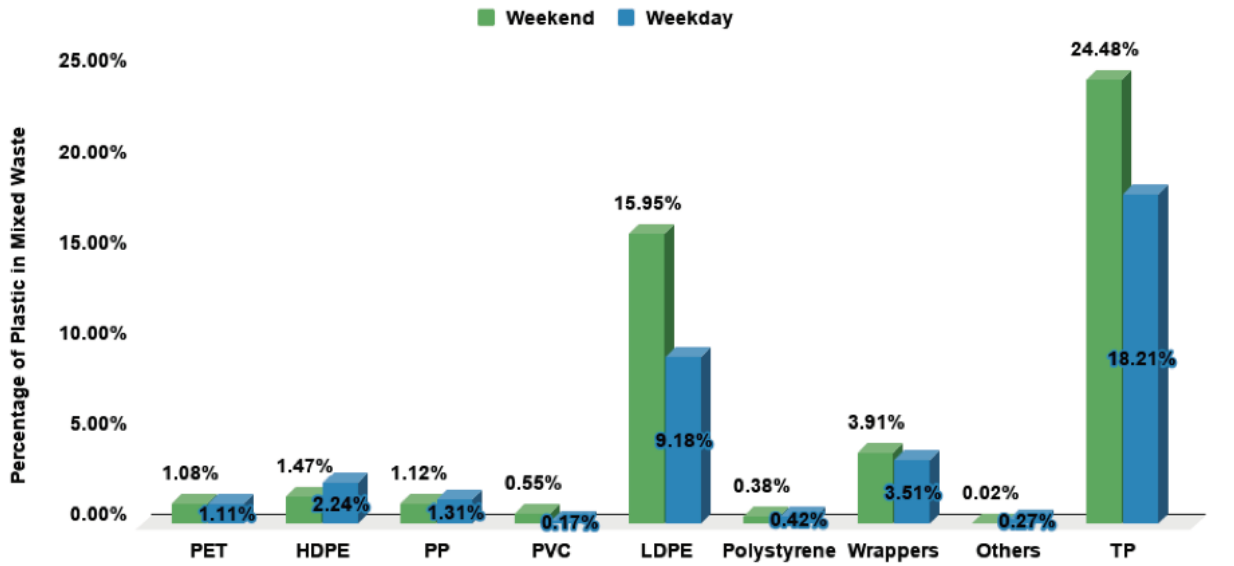

Characterization of plastic waste in urban ICT




Characterization of plastic waste in urban ICT on weekdays and weekends




Characterization of plastic waste in rural ICT




Characterization of plastic waste in rural ICT on weekends and weekdays

# ANNEXURE II
# QUESTIONNAIRE

# 9.1 Commercial questionnaire

General Information

Name: _____ Designation: _____

Commercial Sector:
☐ School ☐ Shops ☐ Government offices ☐ Commercial entities

Name of institution: _____

1. What is the most common type of plastics used in your facility?
☐ PET bottles ☐ HDPE ☐ PP ☐ PVC ☐ LDPE ☐ Polystyrene
☐ Others

2. How much waste do you produce on a monthly basis for each type of plastics

| Type of plastic | Quantity of plastic Kg per month |
|---|---|
| PET bottles | |
| HDPE (milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys) | |
| PP (Bottle tops, biscuit/chips wrappers, ketchup and syrup bottles, food containers, straws) | |
| PVC (medical syringes, drip bags, pipes) | |
| LDPE (Cling film, shopping bags, bubble wrap, sacks) | |
| Polystyrene | |
| Others (CDs, hangers) | |

3. Do you segregate your waste?
☐ Yes ☐ No

4. If yes, do you sell plastic bottles to junk dealers?
☐ Yes ☐ No

5. Who are the main collectors of plastic waste from you?
☐ Scavengers ☐ Recyclers ☐ Government waste management Companies ☐ Janitorial staff

# 9.2 Household consumption questionnaire

General Information

Name: _____

Area of residence
I.e. I9, G7, F-10,: _____

Disposal patterns
1. What does your household plastic waste mainly constitute of?

| Tick box | Type of plastic used | Quality of plastics (unit/month) | Do you reuse/recycle any of the plastic waste generated? |
|---|---|---|---|
| | PET bottles (Mineral water bottles, beverage bottles) | | |
| | HDPE (milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys) | | |
| | PP (Bottle tops, biscuit/chips wrappers, ketchup and syrup bottles, food containers, straws) | | |
| | PVC (medical products, pipes, wires, synthetic leather) | | |
| | LDPE (Cling film, shopping bags, bubble wrap, sacks) | | |
| | Polystyrene | | |
| | Others (CDs, hangers) | | |

**Sample answer:**

| Tick box | Type of plastic used | Quality of plastics (unit/month) | Do you reuse/recycle any of the plastic waste generated? |
|---|---|---|---|
| ✓ | PET bottles | 20 PET bottles | Yes |

2. Who is your household plastic collector?
☐ Scavenger ☐ Waste Management Company ☐ No One ☐ Domestic workers

# 9.3 Formal sector collector questionnaire

General Information

Company Name: _____ Personnel name: _____
Address:
Contact #: _____

1. How much waste do you collect on a monthly basis (tons/month)?

☐ Less than 25000 ☐ 25000-50000 ☐ 50000-75000 ☐ 75000-100000
☐ 100000 – 125000 ☐ 125000-150000 ☐ More than 150000

2. What is the percentage of waste collection efficiency?

☐ Below 25% ☐ 50% ☐ 60% ☐ 70% ☐ between 80%-100%

3. What is the major category of plastics in the collected waste?

| Tick box | Type of plastic | Quality of plastics (unit/month) |
|---|---|---|
| | PET bottles | |
| | HDPE (milk jugs, cleaning agents, toiletri es, furniture, construction pipes, toys) | |
| | PP (Bottle tops, biscuit/chips wrappers, ketchup and syrup bottles, food containers, straws) | |
| | PVC (medical products, pipes, wires, synthetic leather) | |
| | LDPE (Cling film, shopping bags, bubble wrap, sacks) | |
| | Polystyrene | |
| | Others (CDs, hangers) | |

4. What issues prevent you from segregating the waste that is collected?

☐ Finance ☐ Government willingness
☐ Human Resource ☐ No community participation
☐ Transportation and Equipment ☐ Lack of awareness

5. Who is the main collector of plastic waste?

☐ Scavengers ☐ Junk dealers ☐ Waste Management Companies

# 9.4 Questionnaire for hospitals

General Information

Name: _____ Designation: _____

Name of hospital: _____

What is the most common type of plastics used in your facility?

☐ PET bottles ☐ HDPE ☐ PP ☐ PVC ☐ LDPE ☐ Polystyrene Others

1. How much waste do you produce on a monthly basis for each type of plastics?

| Tick box | Type of plastic | Quality of plastics (unit/month) |
|---|---|---|
| | PET bottles | |
| | HDPE (cleaning agents, toiletries, furniture, construction pipes) | |
| | PP (syringes) | |
| | PVC (medical syringes, drip bags, pipes) | |
| | LDPE (Cling film, shopping bags, bubble wrap, sacks) | |
| | Polystyrene | |
| | Others (hangers) | |

2. Do you segregate your waste?

☐ Yes ☐ No

3. If yes, do you sell plastic bottles to junk dealers?

☐ Yes ☐ No

4. Who are the main collectors of plastic waste from you?

☐ Scavengers ☐ Recyclers

☐ Government waste management Companies ☐ Janitorial staff

# 9.5 Junk dealers questionnaire

General Information

Shop Name: _____ Owner: _____
Address: _____
Contact #: _____

1. What is the most common type of plastic bought/sold?

| Type of plastic | Quality of plastics (Kg/Day) | Buying Prices (Per Kg) | Selling Prices (Per Kg) |
|---|---|---|---|
| PET bottles | | | |
| HDPE (milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys) | | | |
| PP (Syringes, Bottle tops, biscuit/chips wrappers, ketchup and syrup bottles, food containers, straws) | | | |
| PVC (medical drip bags, pipes, wires, synthetic leather) | | | |
| LDPE (Cling film, shopping bags, bubble wrap, sacks) | | | |
| Polystyrene | | | |
| Others (CDs, hangers) | | | |

2. Do you buy plastics separately or with other waste materials?
☐ Separately ☐ With other waste materials

3. Why don't you buy it separately?
☐ It's cheaper to buy it with mixed waste ☐ It doesn't come separately ☐ Not applicable

4. Who do you sell the plastics to?

a) Name: _____
Type of plastic sold: _____
Contact information: _____

b) Name: _____
Type of plastic sold: _____
Contact information: _____

# 9.6 Indirect manufacturers of plastic

General Information

Name: _____ Company name: _____

Area/Coordinates: _____

Contact info: _____

1. What type of plastics do you manufacture?

| Tick box | Type of plastic | Capacity of plastic generation (tons/month) |
|---|---|---|
| | PET bottles | |
| | HDPE (milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys) | |
| | PP (Syringes, Bottle tops, biscuit/chips wrappers, ketchup and syrup bottles, food containers, straws) | |
| | PVC (medical drip bags, pipes, wires, synthetic leather) | |
| | LDPE (Cling film, shopping bags, bubble wrap, sacks) | |
| | Polystyrene | |
| | Others (CDs, hangers) | |

2. Are you aware of the eco-friendly alternatives available of plastics?

☐ Yes ☐ No

3. Are you aware of oxo-biodegradable plastic bags?

☐ Yes ☐ No

4. Will you consider shifting your line of production to environmental friendly plastic products?

☐ Yes ☐ No

# 9.7 Recyclers questionnaire

General Information

Company Name: _____ Owner: _____
Address:
Contact #: _____
Is it a registered company? ☐ Yes ☐ No

1. What type of plastic waste do you buy?

| Type of plastic | Quantity of plastics bought per Kg | Buying Prices (Per Kg) | End-product type and quantity |
|---|---|---|---|
| PET bottles | | | |
| HDPE (milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys) | | | |
| PP (Bottle tops, biscuit/chips wrappers ketchup and syrup bottles, food containers, straws) | | | |
| PVC (medical products, pipes, wires, synthetic leather) | | | |
| LDPE (Cling film, shopping bags, bubble wrap, sacks) | | | |
| Polystyrene | | | |
| Others (CDs, hangers) | | | |

2. What do you do with the unusable plastic waste?
☐ Open dumping ☐ Burning ☐ Reuse as it is ☐ Sell to brick kilns ☐ Not applicable

3. Who are your main suppliers?
a) Name: _____
Address: _____
Type of plastic: _____

4. What is the overall cost of transportation?
_____

5. What is the overall capacity of the plant?
_____

6. What is its daily operational cost?

_____

7. What are some of the challenges you face?

☐ Financial ☐ Expensive Machinery ☐ Lack of training and awareness
☐ No Government Support ☐ Human resource ☐ Lack of quality raw material

If others, please specify: _____

8. Who is the main supplier of plastic waste?

☐ Scavengers ☐ Junk dealers

If others, please specify: _____

# 9.8. Scavengers/municipal workers questionnaire

General Information

Name of interviewee: _____

| General Information | Number | Age Range |
|---|---|---|
| Number of family members | | |
| Number of family members working | | |
| Number of children working | | |
| Number of women working | | |
| Number of men working | | |
| Number of third gender working | | |

Area/Coordinates: _____
Contact info: _____
Daily wage:_____

- What is the category and quantity of waste collected?

| Type of plastic | Quantity of plastic (kg/day) | Selling price (per kg) |
|---|---|---|
| PET bottles | | |
| HDPE (milk jugs, cleaning agents, toiletries, furniture, construction pipes, toys) | | |
| PP (Bottle tops, biscuit/chips wrappers, ketchup and syrup bottles, food containers, straws) | | |
| PVC (medical products, pipes, wires, synthetic leather) | | |
| LDPE (Cling film, shopping bags, bubble wrap, sacks) | | |
| Polystyrene | | |
| Others (CDs, hangers) | | |

- Where do you collect plastics from?

☐ Residential Area ☐ Commercial Area
☐ Medical Care Centers ☐ Dumpsite
☐ Others (Please specify)

- What is your frequency of collecting plastics from waste?

☐ Daily ☐ Weekly ☐ Monthly ☐ Other (Please specify)

- What do you do with the unsellable waste?

☐ Open dumping ☐ Burning ☐ Reuse as it is ☐ Brick kilns

- Who are your plastic buyers?

a) Name: _____
Address: _____
Type of plastic: _____
Contact #: _____

b) Name: _____
Address: _____
Type of plastic: _____
Contact #: _____

- What are the challenges you face in this profession?

☐ No social benefits (health, education etc.)
☐ Lack of acceptance in society (government, job market)
☐ No stable income
☐ Competitive collectors-big companies/scavengers
☐ None

- What solution do you propose for the challenges you face?

_____
(Provision of legal rights, formal jobs etc.)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