

# POLICY BRIEF

A collaboration between CPPG and Civil Services Academy

## PAKISTAN ADMINISTRATIVE SERVICE (PAS) CAMPUS LAHORE

### 4th DOMAIN-SPECIFIC MID-CAREER MANAGEMENT COURSE

**Zero Plastic Waste Cities Along Indus River:  
SENSITIZATION AND AWARENESS ON SEPARATION OF PLASTIC WASTE  
THROUGH BEHAVIORAL CHANGE INTERVENTION IN STUDENTS AT  
ELEMENTARY SCHOOL LEVEL IN FAISALABAD CITY**

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FORMAN CHRISTIAN COLLEGE  
(A CHARTERED UNIVERSITY)



CIVIL SERVICES ACADEMY  
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## LIST OF ABBREVIATIONS

ATE	Average Treatment Effect
DEA	District Education Authority
DnD	Difference in Differences
EPA	Environmental Protection Agency
EPR	Extended Producers Responsibility
FDA	Faisalabad Development Authority
FWMC	Faisalabad Waste Management Company
MCF	Metropolitan Corporation Faisalabad
MNC	Multi-National Corporation
PBS	Pakistan Bureau of Statistics
SDG	Sustainable Development Goal
SWM	Solid Waste Management
WASA	Water and Sanitation Agency

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## 1. INTRODUCTION

The latest developmental paradigm of the world now revolves around the SDGs (Sustainable Development Goals) which are also known as the Global Goals. The agenda of SDGs is all encompassing as it encapsulates major problems that the world is currently confronted with. Reducing impact of human activity on climate to protect the planet, and ultimately all humans, is one key element that is common to majority of the SDGs. Pakistan, being the 6th most vulnerable country to Climate Change, must take momentous steps to mitigate the perils it is faced with. Hence, “Living Indus” initiative is one such attempt which targets restoration of ecological health of river Indus within the boundaries of Pakistan. This goal has been planned to be achieved through 25 preliminary interventions, which focus on nature-based solutions and ecosystem-based adaptation measures to protect, conserve, and restore the natural, terrestrial, freshwater, coastal and marine ecosystems in the Indus basin. Intervention no. 6 is “Zero Plastic Waste Cities Along the Indus”, which is the basis of this policy design paper.

### 1.1. SITUATIONAL ANALYSIS

Untreated plastic is one of the fundamental contributors to the environmental pollution. On average, around 12% of waste is generally plastic waste and only around 1% of it is recycled (World Bank, n.d.). The remaining is left to be dumped in drains, water channels and landfill sites to pollute the environment. Pakistan generates around 3.9 million tons of plastic waste annually and approximately 70% of it is mismanaged (Aslam, 2022). Faisalabad, being the 3rd largest city of the country, with population of 3.55 million people is among top generators of waste, which runs to the tune of 1600 tons per day (FWMC, 2022). Of this only 80% of the waste is collected, while the rest is either dumped in open spaces or disposed of into drainage channels. This leads to clogging of the drainage system resulting in slow discharge of water in case of rains and hence causes urban flooding. The Water & Sanitation Agency (WASA) Faisalabad fritters a significant amount of effort and public funds on an extensive cleaning drive every year before the monsoon to ensure that the drains are ready for the influx of rainwater. According to an estimate by WASA Faisalabad, around 6,700 tons of plastic is dumped in waterways and drainage channels per year, out of which around 2,500 to 3,000 tons of plastic waste is cleared from these channels every year, while the rest is washed down the drains (WASA, 2022). This is a significant amount which is being washed up in rivers (river Ravi on the east and Chenab on the west), which are tributaries of Indus and eventually take this water to the sea.

**Figure 1: CHANNEL 01 AT G.M. ABAD DHOBI WALI CULVERT, FAISLABAD CITY**



Source: WASA Faisalabad, 2022

**Figure 2: CHANNEL 03 AT NARWALA ROAD, FAISLABAD CITY**














Source: WASA Faisalabad, 2022



While the lack of operational capacity of FWMC to collect 100% of the solid waste being generated is one of the reasons for this sub-optimal disposal, another reason is non-separation of plastics resulting in failure to recycle them. This non-separation, in turn, stems partly from lack of awareness and partly from the lack of infrastructure and channels required for separation. According to a study, households in Pakistan lack knowledge of waste hazards and 75.9% of waste is not separated (Akmal & Jamil, 2021). Although separation at household level is crucial, it has mostly not happened despite behavioral change interventions in developing countries (Matter et.al., 2013).

As waste generation is a continuous phenomenon with a massive scale and footprint, it cannot be tackled by the governance apparatus alone. In this context, schools are also a sizable source of solid waste but there is a lack of civic education to guide students to put solid waste management into practice. The official curriculum of Punjab Textbook Board contains only one short chapter each about environment in textbook Science for grade-5 and grade-8 (**Figure-3**). It is painful to note that, these chapters also do not emphasize on separation or shaping the behavior of the students permanently. Moreover, there is no practical demonstration or exercise to this effect either.

**Figure 3: CHAPTERS ON ENVIRONMENT AND SOLID WASTE MANAGEMENT IN CURRICULUM OF PUNJAB TEXTBOOK BOARD**

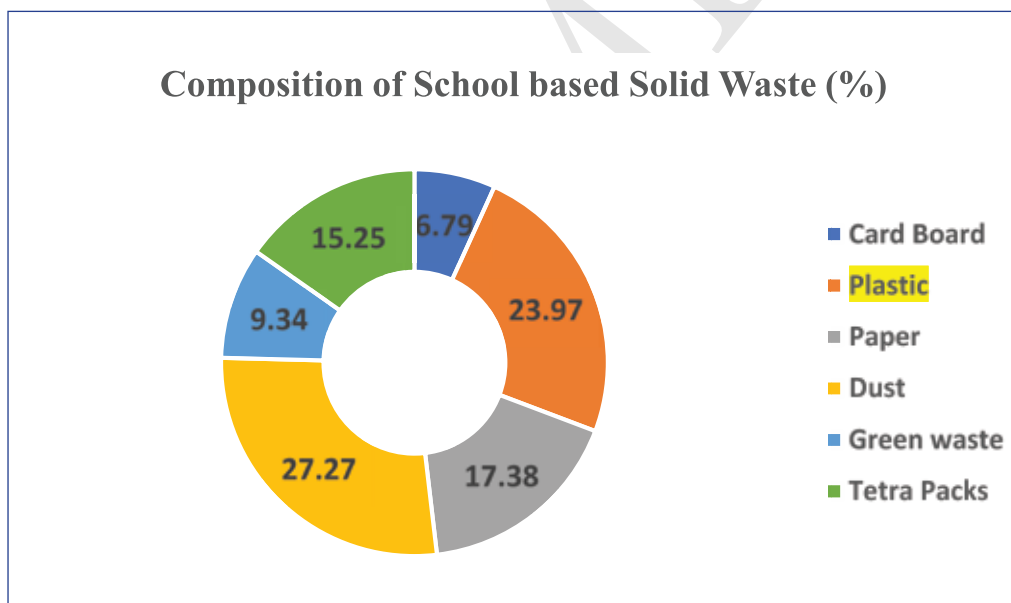
GRADE-8	GRADE-5
<p><b>General Science 8</b> 47 <b>Pollutants and their effects on environment</b></p> <ul style="list-style-type: none"> <li>The second step in three (3) R strategies is "Reuse", i.e., the non-biodegradable objects should be used again and again instead of throwing them after first use.</li> <li>The third strategy is "Recycling", i.e., the waste objects made of non-biodegradable materials should be collected, cleaned, melted and remoulded into new objects.</li> </ul> <p>By adopting the above said (3R strategies) habits, we can conserve our resources.</p> <p><b>4.4 Saving the Earth</b> The Earth is the only planet in our Solar System where life can survive. Pollutants are harmful to the life on Earth. We should keep the Earth's environment clean and healthy. Following measures can be taken for saving the Earth from the toxic effects of pollutants.</p> <p><b>4.4.1 Solid Waste Management</b> Solid wastes include plastic and glass items, styrofoam, sewage sludge, agricultural wastes, and domestic trash, etc. These wastes pollute the Earth's environment when dumped on open places or burnt (Figure 4.13). Hence, we should not dump them in open places nor burn them. They should be managed properly. Landfill, incineration and recycling are the common methods of solid waste management.</p>  <p><b>Landfill</b> In this method, solid wastes are buried in properly designed landfills which are well managed for maintaining hygienic conditions. It is relatively inexpensive method of disposing of waste materials.</p> <p><b>Incineration</b> In this method, wastes are burned at extremely high temperatures.</p> <p><b>Recycling</b> In this method, plastic items (like plastic bottles and polythene bags), glass pieces, aluminium and steel cans, copper wires, etc. are collected separately, cleaned, melted and moulded into new products. In this way, they are used again and again to reduce pollution.</p>	<p><b>Chapter 04 Environmental Pollution</b></p>       <p><b>Ways to Reduce Non-biodegradable Things</b> To reduce pollution of non-biodegradable things, the principle of "4R" is applied. "4R" means to refuse, reduce, reuse, and recycle.</p>     <p>47 NOT FOR SALE-PESBP</p>

Source: DEA Faisalabad, 2022

## 1.2. PILOT STUDY BY FWMC

The composition of solid waste is a function of the nature and socio-economic status of the source. In this regard, a preliminary survey was conducted by the Faisalabad Waste Management Company for the purpose of this policy paper in which solid waste from 24 schools of various localities in Faisalabad was observed for three days and its composition analyzed. It found that on average, around 260 kg was waste generated from the 24 schools, with a total enrollment of 12,403 children. Thus, on average a school with an enrollment of 500 students, generates approximately 11 kg waste every day, of which 2.63 kg (23.9%) is plastic. Given that there are 310 schools only for the public sector in Faisalabad city, the projected waste turns out to be around 3.4 tons per day, of which 818 kg (24%) is plastic. This is a significant quantum and a low-hanging fruit which can be targeted for separation and recycling and can be used to generate a circular economy.

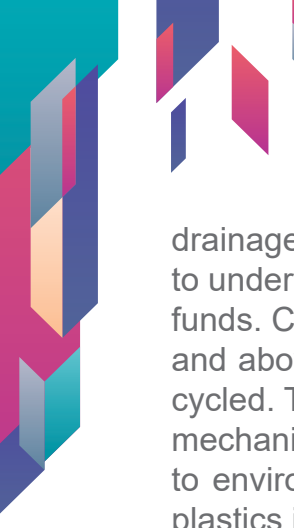
Figure 4: Result of Pilot Survey Conducted by FWMC, 2022



\* Source: Faisalabad Waste Management Company, 2022

## 1.3. PROBLEM STATEMENT

Faisalabad is the 3rd largest city of Pakistan with a population of 3.55 million people (PBS, 2022) which generates 1600 tons of waste per day (FWMC, 2022). Of this, only 80% is collected while the rest is either dumped in open spaces or into drainage channels (FWMC, 2022). Schools are one of the important contributors of plastic waste. According to a pilot study conducted by FWMC, approximately 2.63 kg of plastic waste per school per day is being generated which is not separated and ends up in landfill sites or



drainage channels. This results in blocking of these channels and WASA Faisalabad has to undertake an extensive cleaning exercise every year spending hefty amount of public funds. Considering that there are more than 2500 schools in Faisalabad city (310 public and above 2200 private), a huge amount of plastic waste which is recyclable is not recycled. The major reasons for this are the lack of awareness and absence of separation mechanisms in schools. The negligible reading material regarding factors contributing to environmental degradation, particularly solid waste management and separation of plastics in the official curriculum, is insufficient to shape the behavior of these students.

#### 1.4. RESEARCH QUESTION

**Can enhancing awareness, regarding adverse impacts of climate change and role of plastics in it, encourage separation and improve plastic waste disposal in students in primary and elementary public schools in Faisalabad city?**

#### 1.5. SCOPE

The scope of the study is limited to primary and elementary public schools located within Faisalabad city. The intervention will aim at both boys' and girls' schools and measure the impact of awareness on tendency to separate plastics at source in the target population i.e. students of age 5-14 years of age in 32 schools within Faisalabad city.

## 2. LITERATURE REVIEW

Plastic pollution is a serious issue at global level and its impacts on socioeconomic sectors and ecosystems are often not understood scrupulously. The integration of plastics-waste issue into the educational system has received inadequate attention, especially in the Global South presenting a major challenge to environmental awareness. Despite the importance of early age awareness, the degree of awareness on plastic pollution in public schools remains limited (Dalu et. al., 2020). Several studies carried out both at national and international levels show that the interventions related to community participation through awareness in solid waste management system gave fruitful results and can be replicated in other countries. However, in the case of Pakistan, "normally schools have been ignored in such kind of projects, although they prove to be one of the important sources of awareness generation" (Zahra et. al., 2012).

A study on Faisalabad waste management recommended that the solid waste management issue could be tackled by creating awareness specially at primary school level (Mahar et. al., 2007). Another study that was carried out for solid waste management in Faisalabad recommends that awareness should be spread as soon as possible about the importance of separation and usage of different bins (Yasin et. al., 2017). This is considered important as habitual and behavioral patterns are formed during the formative



years of life.

While these studies have provided a detailed literary and ethnographic review of the problem and possible recommendations, there still exists a gap in the literature regarding the provision of wastebins and the quantifiable impact of awareness and behavior change interventions at the primary and elementary school-level. Moreover, policy prescriptions in favor of a circular economy model can be more effectively implemented if waste separation occurs at the source. Multiple sources may exist within one community, including households, offices, schools, parks, retail stores and meat vendors etc. Thus, this study departs from the existing literature, it aims to generate behavioral change in school going children of primary and elementary level in Faisalabad city.

## 2.1 CIRCULAR ECONOMY

A Japanese saying goes “that it is a shame for something to go to waste without having made use of its potential in full — something that happens with regularity in a linear economy.”

A circular economy is the latest model of recreating value that ends up in prosperity. The model works by extending the lifecycle of a product through recycling, improving design and service and by relocating waste from the very end source of the supply chain to a new beginning. This whole process results into using a resource more efficiently over and over. The model has been executed and advocated by the Environmental Protection Agency (EPA) and United Nations Industrial Development Organization (UNIDO) (National Recycling Strategy, 2021).

Figure 5: Circular Economy Model



## 2.2 Research Design

The proposed study incorporates a quasi-experimental research design that aims at comparing two groups (treatment and control). It proposes to compare a treatment group with intervention and control group without intervention. As explained earlier, the intervention aims at answering the research question by measuring the impact of awareness sessions and lectures on students of Grade-1 to -8 in public sector schools. In order to investigate the effects of intervention a “difference in differences” (DnD) approach will be employed, wherein a rationalized mix of elementary and primary public sector schools, both of males and females, shall be selected through proportional allocation technique from the schools located within Faisalabad City.

While there were other approaches available to measure the impact of the intervention, such as using Randomized Control Trials (RCT) or using the statistical tools such as Ordinary Least Squares (OLS) method, we chose DnD as the sample size of 32 schools may not have yielded sufficient statistical power, rendering the whole experiment futile. While no power calculations were made at this stage, yet the quasi-experimental design of DnD was chosen as it indicates a more reliable causal link in case a significant correlation is found.

In the first phase, the waste bins in both treatment and control groups shall be replaced with double-compartment bins, with yellow and green color for plastic and non-plastic waste respectively. The yellow compartment will have the following message written on it, “Please put Plastic Waste in this Bin” in both English and Urdu language. Conversely, the green bins will display the following message in both languages, “Please use this bin for all kinds of waste, other than plastic”.

**Figure 6: Design Concept of the Double-Bins**



For initial 30 days, no awareness campaign will be launched but data for waste generation will be recorded for each school. After the initial period of one month to obtain the baseline data, half of these schools, randomly selected, shall be given the treatment, while the other half shall work as the control group.

**Table 1: Time Series Data for Treatment and Control Group**

	Plastic Waste as Percentage of Overall Waste in General (Green) Bins for TREATMENT GROUP (%)	Plastic Waste as Percentage of Overall Waste in General (Green) Bins for CONTROL GROUP (%)
Day 1		
Day 2		
...		
Day 30		
	<b>Intervention...</b>	<b>No Intervention...</b>
Day 31		
Day 32		
...		
Day N-1		
Day N		

The treatment shall include short awareness sessions along with distribution of colorful pamphlets explaining the harmful impacts of climate change and the factors causing those. Each session shall be concluded with a prompt to “do our part by separating plastics”, as not doing so impacts the environment adversely. The awareness sessions shall be held once a week for each school in the morning assembly and will continue for four weeks (one month). More precisely, as our unit of randomization is the ‘school’, the treatment shall mean that every class in a school which is in the treatment group has had an awareness session at least once a week during the intervention month.

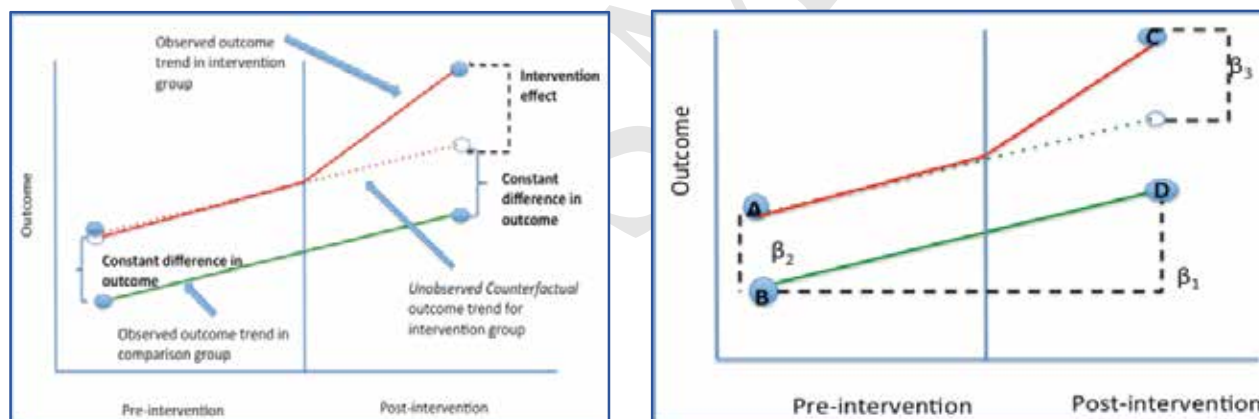
The waste generated shall be monitored on daily basis which will generate our primary dependent variable i.e., the **amount of plastic waste as a percentage of the total waste disposed into the green (non-plastic) bins**; this shall be denoted by  $\bar{Y}$ . The  $\bar{Y}$  shall be calculated for treatment and control groups separately, as follows:

$$\bar{Y} = \frac{\text{Total amount of Plastic in the Green Bins in Treatment (or Control) Group}}{\text{Total amount of Waste in the Green Bins in Treatment (or Control) Group}} \times 100$$

Thus,  $\bar{Y}$  will be a measure of inverse-separation, as a low  $\bar{Y}$  means that the separation is improving while a high  $\bar{Y}$  would indicate relatively poor separation. To calculate this, the amounts (in kgs), as indicated in the equation, for each school shall be added to get the total amount of plastic as well as overall waste disposed in green bins for each day. This will then be used to calculate the daily  $\bar{Y}$ , separately for treatment and control groups. Daily readings will then be used to create a time series data in which the value of the variable  $\bar{Y}$  for treatment and control groups shall be compared over time and impact i.e., the average treatment effect (ATE) will be measured through a DnD approach using the following conceptual model:

- Calculate the before-after difference in the outcome ( $\bar{Y}_T$ ) for the treatment group = (B-A)
- Calculate the before-after difference in the outcome ( $\bar{Y}_C$ ) for the comparison group = (D-C)
- Accordingly, the difference-in-differences:  $DnD = (B-A) - (D-C)$

Figure 7: Difference in Differences Approach



From a more statistical standpoint, in the instant case, it would be a two-period setting with data for pre and post intervention periods for Treatment and Control groups, which is given by the following equation:

$$Y = \beta_0 + \beta_1 * [Time] + \beta_2 * [Intervention] + \beta_3 * [Time * Intervention] + \beta_4 * [Covariates] + \epsilon$$

Where,

Coefficient	Calculation	Interpretation
$\beta_0$	B	Baseline average
$\beta_1$	D-B	Time trend in control group
$\beta_2$	A-B	Difference between two groups pre-intervention
$\beta_3$	(C-A)-(D-B)	Difference in changes over time

The **average treatment effect** calculated through this approach will give us the impact of the awareness sessions on molding the behavior of the target population i.e., the children.

While the data from the yellow bins will also be recorded as the sales of separated plastics will require a proper record-keeping and accounting system, yet it will not have any direct bearing on the research design and will not be a part of our statistical analysis as a variable. However, it will indeed have an indirect effect on shaping the behaviors as its proceeds will be utilized for incentivizing the students by arranging entertaining activities such as magic shows, or field trips, with environmental protection as the central theme.

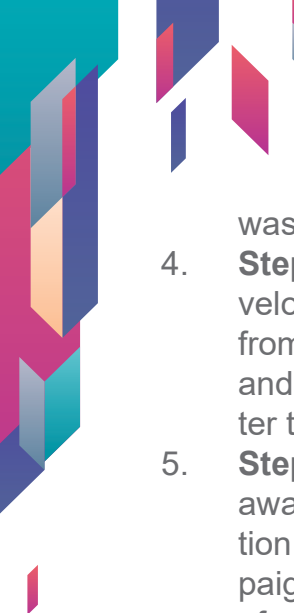
### 3. METHODOLOGY

#### 3.1. Description of the intervention

The intervention proposed by the group is aimed at encouraging separation of plastic waste from the municipal waste through awareness as part of the larger intervention of zero plastic waste in cities along Indus River. The study involves the use of circular economy model by incentivizing the target population through proceeds of sale of plastic waste separation as explained in 2.1 (Figure 5). The research focuses on studying the behavior of school children between the age of 05 and 14 years to respond to the important initiative of separation of plastic waste from the overall solid waste generated in schools. The proposed intervention may be divided into following main steps (**Figure-6**):

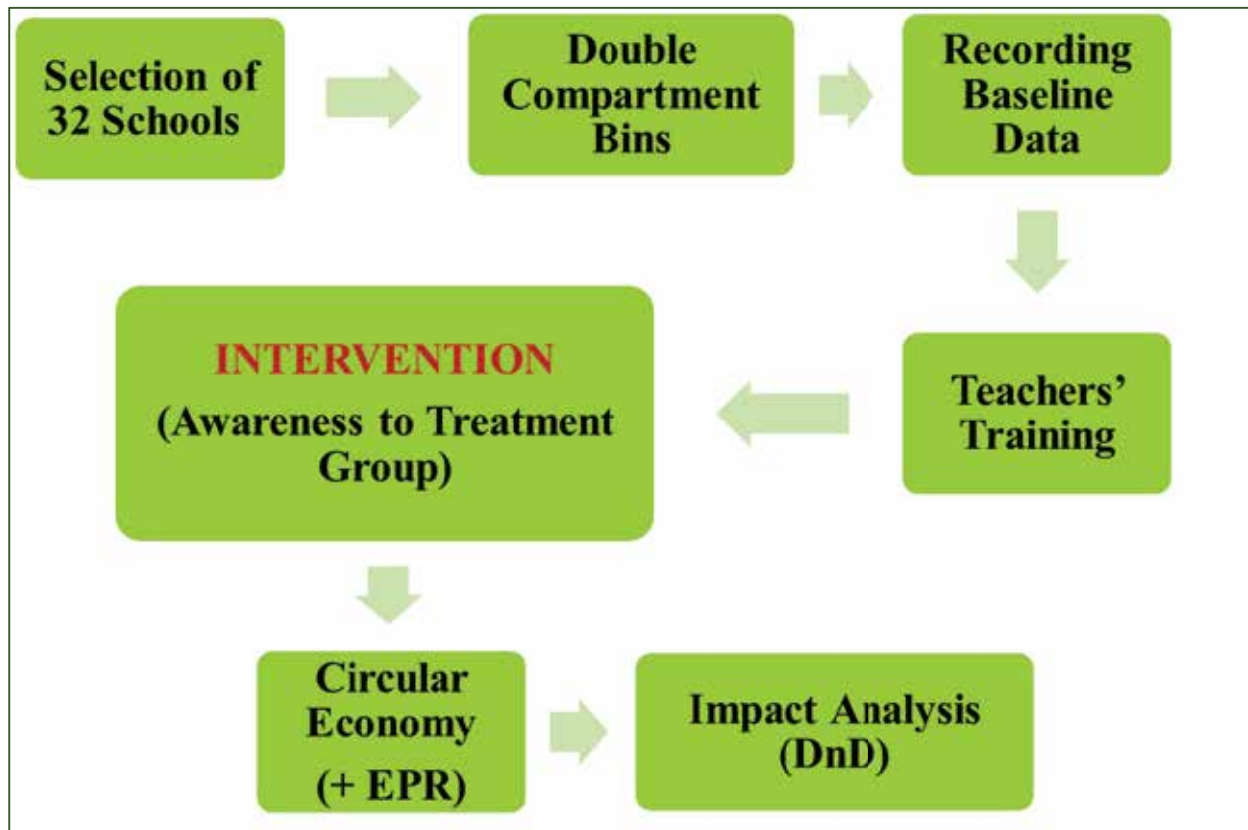
1. **Step 1:** In the first phase, the target schools, 32 in number, will be identified and divided into two halves equally by ensuring gender equality. One group will be control and the other will be treatment group. That is, of the 32 schools, 16 will be boys and 16 girls' schools with 08 schools from each category in control and treatment group respectively.
2. **Step 2:** The waste bins in these schools shall then be replaced with double-compartment bins, where each set will have two bins of different color: yellow and green. The yellow bins will be solely for the collection of plastic waste whereas the green bins will be for overall solid waste.
3. **Step 3:** For initial 30 days, no awareness campaign will be launched but the total



- 
- waste generated by each school in both types of bins will be recorded.
4. **Step 4:** In the meanwhile, training modules for teachers and students will be developed along with the reading material to be distributed to students. The teachers from the treatment group schools will be imparted trainings at designated venues and relevant reading material shall also be provided to them. These will be the master trainers. (Phase-3 & 4 can run simultaneously)
  5. **Step 5:** In the next phase, the students of treatment group of schools will be given awareness sessions, in school assemblies as well as in classes, about the separation of plastic waste from the rest of solid waste by the master trainers. This campaign will continue for one more month. During this phase, the waste generation of each type shall continue to be recorded for both treatment and control group schools.
  6. **Step 6:** Simultaneously with Step-5, a model for circular economy shall be developed through PPP, whereby the plastic separated in the yellow bins, shall be collected and sold to either local informal waste collectors, or directly to commercial concerns who produce plastic products, for buy-back as a compelling part under their Extended Producer Responsibility (EPR). This amount shall be used to incentivize the students (of the treatment group only) by arranging entertaining activities such as magic shows, or field trips, with environmental protection as the central theme. This will reinforce the awareness sessions and also add an additional impetus to bring about the intended behavioral change.
  7. **Step 7:** Finally, at the end of the second month, data obtained shall be analyzed through statistical tools to establish causal links and gauge the impact of the intervention.

The **key partners and stakeholders** involved in the intervention are the students of primary and elementary schools of Faisalabad City, District Education Authority (DEA) of Faisalabad district, especially the headmasters and headmistresses of the schools in treatment and control groups, teachers and staff of respective schools, Faisalabad Waste Management Company, Water & Sanitation Agency (WASA) Faisalabad, and the plastic vendors and commercial enterprises buying back the separated plastics.

Figure 8: Seven Step Process of the Intervention



### 3.2. Risk Management

The external variables which may cause **spillover effect** include the mixing of waste generated from the teachers with the waste generated from the students, as the intervention is aimed at measuring only the impact of intervention on students. Second risk factor is that some teachers may try to influence the behavior of students in addition to the prescribed treatment, for any incentive or with an idea to make their school's performance 'better' than the others. Third, source of error could be the mishandling or mixing up of the waste by the janitors, who are responsible for collection of the waste from bins to a centralized location within the school for further disposal. The janitorial staff shall also have to be sensitized and trained to ensure correct execution and measurement of the variables.

Similarly, another cause of concern while designing the experiment was the amount of non-plastic waste that is disposed of in the yellow (plastic) bins. This is also a source of non-separation and ideally, its amount should be adjusted for in the overall calculations. However, we decided that doing so would make the design excessively complicated and it will not be possible to accurately measure all these variables correctly. Therefore, it

was assumed that no non-plastic waste will be thrown in the plastic (yellow) bins. However, this is an assumption which should be checked during the execution of the study and if required necessary adjustments at operational or design level be made to ensure that impact is measured correctly. Lastly, operational risks must also be guarded against as they may render the whole experiment useless if it is not executed properly.

### 3.3. Budgetary Requirements

The indicative costing of the intervention has been estimated under three basic heads of expenditure in this design, which are:

- i. Cost of customized waste-bins **(A)**
- ii. Cost of teachers training **(B)**
- iii. Cost of awareness material for students **(C)**

The detailed cost estimates for each head have been tabulated below.

#### Cost of Customized Waste-bins:

In each school there will be approximately 10 to 15 places where double-compartment bins will be placed. Accordingly, the estimate is as follows:

Total number of bins in 1 school	= $15 \times 2 = 30$
Cost of 28 bins at 14 places (classes, ground, canteen)	= Rs $1,000 \times 28 =$ Rs 28,000
Cost of 2 bins near main gate	= Rs $7,500 \times 2 =$ Rs 15,000
Total cost of bins for each school	= Rs 28,000 + Rs 15,000 = Rs 43,000
<b>Total cost of Bins in 32 schools (A)</b>	= $32 \times$ Rs 43,000 = Rs 1,376,000

#### Cost of Teachers Training:

From each school, 2 teachers are trained as a master trainer who will further arrange awareness sessions in their school. Accordingly, the estimate is as follows:

Total number of teachers in 16 treatment schools	= $16 \times 2 = 32$
Estimated cost of two days training for 32 teachers	= Rs 200,000
Estimated cost of Reading Material for teachers	= Rs 100,000
<b>Total teachers training cost (B)</b>	= Rs 200,000 + Rs 100,000 = Rs 300,000

#### Cost of awareness material for students:

As per data from District Education Authority Faisalabad, average enrollment in primary/

elementary schools is 500 students. We need to give different pamphlets for awareness to students each week so for each student 4 pamphlets are needed in a month. Accordingly, the estimate is as follows:

Estimated Cost of one pamphlet	= Rs 50
Total cost of pamphlets for each school per month	= Rs 50*4*500 = Rs 100,000
<b>Total cost of pamphlets for 16 treatment schools (C)</b>	= Rs 100,000 * 16 = Rs 1,600,000

#### Total cost of the intervention

- Total cost = Cost of Bins + Cost of Teachers Training + Cost of Awareness material
- Total Cost = A + B + C = 1,376,000 + 300,000 + 1,600,000 = Rs 3,276,000 (approximately)

Finally, including 5% contingency (unforeseen expenditure), the cost estimate can be rounded off to approximately **Rs. 3.5 million** for the study spanning two months and 32 schools.

## 4. THEORY OF CHANGE AND EXPECTED OUTCOMES

### 4.1. Theory of Change

The ultimate objective we want to achieve through this intervention is reduction of plastic Waste. This long-term goal is meant to be achieved through the transformational journey of behavior change of children in school. The intermediate-stage intervention is the placement of compartmentalized bins: for plastic and non-plastic waste. These bins will be separated not only by color coding but will also by bi-lingual messages printed on them for plastic and non-plastic waste respectively. This step will further be supported by the awareness sessions that will be conducted in the schools. This is the second step in this policy intervention. The material in the form of printed guidelines, or audio-visual clips carrying underlying messages regarding damages caused by plastics to the environment will be highlighted in a very simple, yet effective manner. It is presumed that being a part of this society where the culture of solid waste management is not so rich and ingrained, the students will be more curious to learn about it and know more about it. These sessions will stir the minds of students and based on these awareness sessions, the behavior of students towards plastic separation will be monitored and calculated. Once the separation increases at the source, it will be utilized for recycling and ultimately that is leading to reduction of plastic waste in the environment, which is the ultimate goal.

In essence, separation makes recycling possible, and recycling leads to reduction in production as well as reduction in discharge of plastics into the rivers and landfill sites. Thus, promoting behavioral change to induce separation of plastic at source feeds into



the overall goal of zero plastic waste in cities along river Indus.

## 4.2. Expected outcomes

The primary outcomes expected from the study are:

- i. An evidence-based correlation will be identified between increased awareness of plastic separation and improved separation behavior of the target group (that can be scaled nationally).
- ii. A precedent-setting public private partnership (PPP) will be tested to introduce a circular economy model.
- iii. A scalable framework for provincial education departments will be provided to introduce low-cost initiatives for waste separation.
- iv. A sustainable document and module for plastic waste separation at the school-level shall be created.
- v. A group of master-trainers will be developed to present a system of knowledge-sharing that can be scaled nationally.


Specifically, the expected outcomes of the instant study include reduction in the percentage of plastic waste being disposed of into the green bins. Reduction in this variable depicts the increased tendency to separate the waste as a result of the awareness being imparted through assembly sessions as well as the infotainment activities. In addition, implementation of the circular economy model and roping in of the commercial enterprises under EPR will create a conducive environment for plastic-recycling. This will eventually not remain limited to the schools only but will thicken the market of recyclable plastics, thus also incentivizing both households and commercial markets to separate waste & recycle it.

## 5. CHALLENGES AND EXPECTED POLICY RESULTS

Assuming, the intervention yields positive and statistically robust results, it will justify a modification in the curriculum to inculcate similar sense of responsibility towards the environment and activism in the target age-group. This modification will include adding chapters and modules to the textbooks, as well as introducing mandatory field activities to enable the students to practice their learning. On the supply side, the plastic bins will have to be replaced in the entire Punjab and double-compartment bins will be provided. While the curriculum would be modified in the entire province, the replacement of bins should be done phase-wise with the schools in the urban centers being converted first. This is because the quantum and composition of solid waste is a function of the socio-economic status of the source, and it can be assumed that the use of plastics in urban area schools will be much higher than the rural area schools.

In addition to change in curriculum and provision of double-bins, policy instructions shall have to be issued to the entire educational infrastructure to implement the separation





policy. This may include colleges and universities as well. Requisite KPIs shall have to be devised and operationalized to ensure proper monitoring and evaluation. In this regard, private institutions may pose a challenge due to the limited regulatory capacity and weak monitoring mechanisms, but it is hoped that the circular economy model will complement it and lead to internalization of the initiative at the organizational level. Hence, adequate regulatory and enforcement mechanisms will have to be put in place to ensure that EPR liabilities of industry stakeholders are duly and efficiently met. For this, new economic models, as well as industrial and consumer behaviors may have to be tested. Moreover, informal waste collectors may need to be brought into the formal partnerships.

Finally, addressing the plastic waste challenge will not be possible through a traditional linear problem-solving approach, which focuses on single-point technical solutions. This will require a holistic policy approach using systems thinking and test various combinations of policy solutions that create a conducive environment that enables a systemic transition to a more efficient and sustainable management of plastic waste (UNDP, 2021).

## 6. CONCLUSION

Statistically significant and sizable impact of the intervention will indicate a causal relationship between awareness and separation, showing a positive behavioral change in the target population. It will also result in separation of a considerable quantum of plastics at the primary stage, facilitating its recycling as a second order effect. The figures from the pilot study indicate that schools generate considerable waste with almost 24% of it being plastic. Behavioral change at school level will not only reduce plastic production by enabling recycling, but also lead to positive ripple effect by dissemination of the imparted awareness and changed behavior to the households of the students in the short- to medium-term.

## 7. RECOMMENDATIONS

Based on the proposed intervention design and expected outcomes, the team proposes the following policy recommendations:

- i. Inclusion of recycling of plastic and its separation in curriculum at primary and elementary level should be made for the entire province.
- ii. Placement of double-bins should be scaled up phase-wise, with schools in urban centers across the Punjab being targeted first. These may include district and divisional headquarters as well as schools in any sub-division with a certain threshold population density and urban characteristics.
- iii. Eventually, a national policy of use for waste management and plastic disposal in educational institutions must be devised and implemented across Pakistan. This will require collaboration at the level of Ministry of Climate Change and Inter-Provincial Coordination.

- iv. A framework for a circular economy model should be developed by using both economic incentives as well as regulatory tools & strict enforcement, in order to improve collaboration and establish new partnerships with private waste collectors and MNCs. For this too, Ministries of Climate Change and Inter-Provincial Coordination will have to take the lead. Moreover, the provincial EPAs and Industries Departments will have to collaborate.
- v. Impact analysis of intervention should be studied and presented for the consumption of stakeholders across provinces.
- vi. Future Studies can be conducted on ascertaining the retention of this behavioral change in the children, once the intervention is stopped. In that case, stopping of the awareness sessions will be considered to be the intervention and its impact on separation be measured statistically. Accordingly, the curriculum changes and activities may be designed in light of these results.

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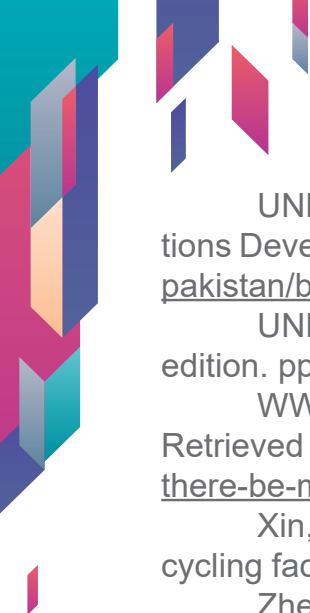
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