Analysis of the Usage of Plastic Utensils in Café Facilities: A Case Study of Universities in Islamabad

Muhammad Sajjad Hussain, Muhammad Husnain, Syed Talal Raza Shah

ABSTRACT

With the advancement in affluence and lifestyles of societies, the environment seldom considered as a stakeholder. Since the innovation of plastic, it has surmounted every aspect of life including food consumption patterns, especially in urban areas. When it comes to café facilities in universities, excessive use of plastic observed as plastic utensils are easy to manage and they do not require an excessive budget. The study focuses on the café facilities in universities situated in the Federal Capital Territory of Islamabad, Pakistan. Cluster sampling employed and the population clustered in five "W" category universities. The research aimed to gauge the awareness level of the university students regarding the environmental and health hazards of the consumption of plastic and their willingness to change their consumption patterns after getting the essential awareness. About 105 responses recorded through a Google Form survey conducted in the top five public universities of Islamabad. The research concluded on the analysis of the survey, which envisages that the students are much likely to appreciate the reusable crockery instead of the consumption of plastic utensils. This research provides convincing remarks to the university authorities to change their policy of plastic consumption and turn to reusable crockery, which might cause a heavy installation price but will be beneficial to the environment and health.

Key words: *Plastics, university cafés, pollution, policy*

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Introduction

The usage of plastic in human history started since the industrial revolution where the innovation in technology is taking place on a rapid and daily basis. The industrial revolution had brought huge changes in the daily work mechanism where every task accomplished in seconds, reducing the physical efforts and time constraints of work. Historically, human beings have used metals to develop tools for 5000 years. In 1905 the chemist Leo Baekel, working with formaldehyde-phenol resins in an effort to strengthen wood extraction, ended up in the form of Bakelite. Bakelite was cheap, easily and quickly molded. The introduction of Bakelite said to be the age of the plastic, which has transformed into big industries and employed about 60 million people [1].

The usage of plastic material is low in cost and easy to carry [2] which have successfully convinced the people around the world to give it more preference. However, such usage has huge health hazards as the chemicals like Biphenyl-A (BPA) [2,3] leaked from plastic, have a toxic effect on foods, leading to the diseases like-hormonal imbalances, infertility, early onset of diabetes, hypertension, cancer, and breast cancer, etc. Tons of plastics produced every day where half of them dropped within the landfills but other remains in the form peppering on the roadsides and strewn by the winds carrying it into rivers and seas. It is extremely dangerous and toxic for the flora and fauna [4].

The crucial impact of improper solid waste is on those populations living near the dumping sites. The poor management of plastic wastage led to huge problems in the sanitation process and increases the level of contamination of public water supplies [5]. The scientist had set targets for polyvinylchloride (PVC) found in plastic pipes; polystyrene is known as Styrofoam; a major component of furniture and upholstery and polycarbonate used in the manufacturing of the baby bottles and electronic devices [6]. It leads to the devastation of the healthy life of the whole area of the living population as the diseases disseminated among the large population [5,7].

The common fact in the usage of the plastics is that they are easy to carry with a low burden of cost,

which has considered it beneficial for the markets as well as for the users. This mere fact is useful for the short term rather than the long term because the diseases, which enhanced through the usage of these materials, are devastating. It has gauged various forms of diseases, directly and indirectly affecting the growth of a society.

Research Objectives

The purpose of this research is to analyze the willingness of the university students to change the consumption of plastic utensils in café facilities and use reusable cutlery as an alternative to one-time use (disposable) plastic utensils used in café facilities situated in their respective universities. Along with that, the research aimed to disseminate awareness about the health and environmental hazards caused by the consumption of plastics. The research aims to present a plea to the authorities of the university to change the cutlery in their university café facilities and this research performs as the basic survey for that plea.

Literature Review

Marine pollution due to plastic disposable mismanagement

Marine issues are the result of the environmental mismanagement of the plastic disposals where the effects considered on two bases such as direct effects and indirect effects [8]. The direct effects of the marine are through the marine debris where it affects the marine species on various scales such as; Ingestion, Entanglement, and Ecosystem.

The term "Plastic-sphere" clarifies the role of plastics polluting the environment directly. As this target, the seabirds with micro-plastics, which is considered a huge threat for marine seabirds, like Whales. As well as it affects the higher level of business corporations in the form of lack of tourism due to the rise of pollutions such as disfavored smell which leads to a health hazard for human beings [9].

Considering all the given facts into consideration the government of Punjab recently decided to ban the disposable cups and plates made up of Styrofoam, which declared by a scientific panel to be unsafe for packing food items where the regulation highlighted the point for the usage of Styrofoam and newspaper materials are unlawful [10]. Therefore, Pakistan Food Authority after the decision also highlighted the snacks industry to focus on the quality of spices, pulses, and flour to be of standard quality [11, 12].

Impacts of plastic disposables on health

The health hazard of the plastic is vulnerable as there are diseases, which are the results of the chemical being untreated (I-E) cyanides, mercury and polychlorinated biphenyls, which is highly toxic and leads to cancer. The reason behind this said to be colored plastics [13]. The colored plastics banned within different parts of the world. The further impact on human health is the presence of the Bisphenol A (BPA) used in plastics to keep them hard. It causes early puberty in girls, premature labor and reduction of fertility in women. These toxic agents cause physical defects in newborn babies [14]. It is documented that 96% of women are having BPA [15].

The administration who directs the regulation policy on food packaging like beverages, water, cosmetics, etc. are failed in their policies as the food packages are highly toxic in its nature. The report given by the European study stated that 2-5% of food packages (yogurt, soy, bread and rye products) are panic-stricken of carbon footprint: however, the study identifies the fact that within the water bottles there is a high concentration of toxic ion [16]. Therefore, the usage of plastics has been limited within states like the UK, the USA who imports these beverages from France, Italy, and China [17].

The major insights of the plastic effect are in the form of usage of plastic bottles for drinking purposes. The study says that the bottles used within developing cities like America are comprised of a chemical named phthalates to extend the life of water bottles but the consequences inhaled through such a mechanism is far more devastating such as sperm count, testicular abnormality, tumors, and gender development issues [18]. Food materials being in particular packages converge into toxic nature due to having sensitive polymers limit sized with a particular temperature. Hence, if the temperature of food exceeds the limits then polymers transmute into chemical reactions like BPA, Styrene, Vinyl Chloride and concentrated polymers leading to hazardous health diseases and infections.

The disposable plastics are usually disposed of or left within the environment as litter posing an increase in the harmful chemical, which affects human life in the form of heavy metals such as cadmium, lead, benzene and dioxins and other pollutants in the air, water and landfills [19]. The incinerators presented in plastic materials are having a higher concentration of toxicity as it is from the emergence of dioxins composed of seventy-plus chemicals leading to immune problems and reproductive systems. Its dissemination in soils, air, and groundwater results in disastrous health effects.

Moreover, plastic disposable impacts on the third world are more serious and said to be hazardous as the mismanagement of non-biodegradable plastic bottles for water, etc. are highly being unavoidable in day-to-day usage. The solution for such an entrenched problem demands a high level of awareness campaigns, even though the fact is that developed states are also being ignorant of this culminating issue. However, its emergence is the essence of other

major disasters considered a threat to human lives and biodiversity [20].

The major reason for the usage of plastic-based items is its prescription in giving the desired effect like its shape, color, etc. making it unique and attractive. Despite the fact of how dangerous, it is for health. Moreover, the ignorance of the world in the contemporary era about the promotion of such items is the big reason for its dissemination in the market. However, the study highlights that a chemical with the name of polystyrene is dangerous for health, was used by MacDonald's for the hotdogs, teacups and other fast food whereas the same kind of compounds is being used by different companies for producing baby feeding bottles and toys[21].

The future generation is heavily on the dawn of fire due to this certain product, as it does not correspond to its disastrous effects. However, the study emphasizes for some of the alternatives to be pursued like Pyrex, paper and cloth bags, curable objects based on cotton materials should be preferred. Moreover, the plastic bottles for babies can be replaced with reusable cups, and promotion bioplastic is more preferable than plastics as it can be degradable and reduces the extra fossil fuels so that to save the environment [22].

The environmental implication of plastic usage

The usage of coffee via disposable cups is the reason for higher wastages of trees etc. However, it can easily be substituted with reusable cups which is said to be a little costly but a great savior for the environment and health of society [23]. The narratives of "Recycling plastics" set by Plastic Pollution Coalition (PPC), for saving the environment from the devastating nature of plastic products were failed. The reason is totally being unable to accomplish the goal of 93% reduction in plastic-based items like straws, and other utensils. As a result, these hazardous materials are not treated successfully. Therefore, it leads to a consequential effect on environmental issues [24]. Even though different companies tried to convert this recycling into a new concept, termed as bioplastics, which claimed to be non-toxic and biodegradable, but still, the mere truth is that such a mechanism bounded with higher usages of chemicals declared dangerous for the environment [25].

The wastages of these plastics due to being landfilled in the agriculture sector (nutrients for humans and wildlife) having a drastic-results for living organisms. These nutrients converted into carcinogenic (cancer) crops leading to enzyme disorders, endocrinal disorders, infertility, hormonal disruption and a mere threat for animals and marine organisms [26]. However, the recycling process is mostly being minimized via landfilling of plastic wastages. Therefore, it bears a threat to the environment because it passes through the process of combustion, cement kiln, etc. by the industries [27].

The result under this assessment is that plastics are useful as they are cost-effective, time reductive and easy to carry but the consequences for the environment are disastrous as they show their effects in the long term which are then difficult to be prevented and cured. Therefore, the usage of plastics requires a huge focus of international organizations like the World Health Organization (WHO). The organizations are the stakeholders of the environmental policies concerning health and environmental challenges, raised by the industrial corporations for prolonging of their businesses [28].

Substitutes

For circumventing the non-biodegradable plastics there is a dire need for the adoption of the latest preferential idea where the research has to prefer biodegradable products having the potential to work as petroleum-based plastics that cannot be degraded or recycled with a heavy cost [29]. The biodegradable based on the biopolymers considered formula forming bioplastics, which further classified into three categories such as;

- Bio based-non-biodegradable bioplastics [29] (e.g., polyethylene terephthalate PET, PETE,
- Bio based-biodegradable bioplastics (e.g., PLA, polyhydroxyalkanoates (PHA) or starch, other polysaccharides or proteins)
- Fossil-based biodegradable bioplastics (e.g., polycaprolactone (PCL) [30]
- Moreover, bioplastics considered as hydrophilic resulted from microbial fermentation (PHA) (Geueke 2014) having the potential to act as a barrier for water vapor, and also gas emission promoting it to be an excellent option for food packaging requirements. Therefore, biopolymers are more preferential than petroleum-based plastics, which can be degraded resulting in a reduction in environmental pollution [31]. Somehow, extensive studies also conducted for bioplastic through polylactic acid (PLA) as well as starch considered beneficial [32]. Due to the fact of being degradable where the blending of these polymers inadequate proportions with the incorporation of some compatibilizers has yielded high-performance films, which can meet several packaging requirements, especially food packaging [33].

The daily usage of waste materials rose in the United States of about 2.7 lb in 1960 to 4.4 lb in 2003 [34] causing a great deal of pollution in the landfills. It needs a great deal of attention towards the reusable products, which can give relief from such an embarrassing level of pollution [35]. Therefore, research has identified the formation of reusable items leading to beneficial results in terms of economic, health and environment. The research has brought the result of

about thousands of dollars saved through reusable crockery in the busiest hour of lunch rather disposable cups and plates, which proved for having a huge financial loss identified by the manager [ibid]. The role of reusable items are not only beneficial just in economic terms but also has the large level of benefits for an environment where cafeteria manager spent $84,480 annually for disposable cups and plates that were not recyclable [ibid].

Theoretical Framework

Environmental significant behavior

The role of an individual with respect to the environment has a particular concern with his behavior where it is based on his perceived belief and values for the environment. The Environmental Significant behavior (ESF) was developed by Paul C. Stern, a senior scholar and president of National Research Council [36] to assess the role of an individual person with their environment where he identified the role of each household to be the cause of global warming, etc. [ibid]. ESF is considered an important model used for various platforms concerning environment where it assesses environmental behavior in accordance with public policies, individual choice of consumerism, and individual behavior with the environment [ibid] and the study is suitable for the usage of plastic-based food materials by individuals and public.

Theoretically, ESF comprises Environmental Activism (EA), Private-sphere environmentalism (PE) where they are being affected by causal factors comprised of attitude toward behavior (Attitude), personal capabilities (PC) and Contextual factors (CF) [ibid]. The conceptual model of ESF shows that the causal factors comprised of Attitude, PC, and CF are the ingredients of the decision on the EA, which considered as the hub of public policy, a social movement with respect to the environment. It also affects PE where PE highlights the preference of individual choice concerning environmental decisions [ibid]. Attitude towards the environment refers to the individual's evaluation of his action with respect to his norms and beliefs, perceived costs and benefits of action about the certain thing. Personal capabilities rely on literacy, social status, knowledge, and financial status. Contextual factors are composed of material costs and rewards, laws and regulations about a certain issue and available technology.

The ESF considered a theoretical framework where the EA shows the role of the institutions, having the authority to make the decisions. Therefore, the university head considers the activists making the decisions on behalf of university utensils. The students who informed through a questionnaire about the perils of food items packed with plastic-based materials considered as the PC where the response after filling the questionnaire will determine their Attitude. The Attitude after knowing the hazardous effects of plastic usage in the university cafeteria will be supposed to convince the authorities to go for the alternate. The study suggests various alternatives based on biodegradable based materials and crockery items which are considered cost-effective and also beneficial for long term usage.

Methods and Techniques

The research is quantitative in nature. A structured questionnaire designed comprising of multiple subquestions. These questions asked students to select universities to gauge the awareness and satisfaction level about the environmental and health hazards of disposable plastic containers used in café facilities of universities. The pattern of a questionnaire designed to highlight the harmful effects of plastic on the students. However, the aim of the questionnaire was to gather the response of participants after letting them know about the hazardous defects of the plastic served in the cafeteria services. The feedback measured on a Likert scale. Likert scale is a rating scale based on the assumption that each statement has equal attitudinal value and importance [28]. So, the research is based on defining the intentions after perceiving the fact regarding plastic utensils, Therefore, the Likert scale sampling is the most appropriate one in this regard. Each question had four options: yes, no, maybe, and maybe not.

The objective of the questionnaire was to get an insight from the university students regarding their willingness to change the plastic containers to reusable cutlery. The questionnaire comprehensively covered the aspects of reusable utensils, awareness for the health and environment hazards, plastic disposal practices, and the impacts of usage of plastics such as Bisphenol on health. The questionnaire has targeted the best W category Universities of Islamabad, as these Universities are considered the best in their research [29]. Therefore, the aim of the questionnaire was to gauge the idea about the awareness of the students about plastic usage. It focused on the lesson learned for top management who are responsible for the management of student affairs concerning their education as well as their health in the confined boundary of the university.

The questionnaire aimed to analyze the awareness level of students in regards to environment conservation and gauge their willingness to give up environmental hazardous products after getting the required awareness. Hence, each question aimed to provide awareness about the concerned subject in question and then gauge the willingness of the respondent to give up the consumption of that product after getting the awareness through this questionnaire.

Sample Size and Population

The research focuses on the university situated in the Federal Capital Territory of Islamabad, Pakistan. Five major universities were selected to conduct the research; namely, Quaid e Azam University, National University of Modern Languages (NUML), National University of Science and Technology (NUST), National Defense University, and COMSATS Institute for Information Technology (CIIT). The universities selected on the bases of their Higher Education Commission, Pakistan ranking, realized in February 2016. The selected universities belong to the 'W' category of universities situated in Islamabad. The geographic distribution of the respondents is further narrow down to the sub-national level in order to make the sample more representative.

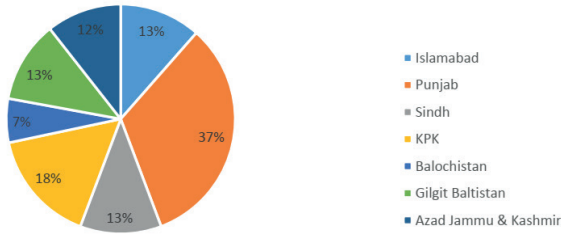

Figure 1. Geographic Distribution of Students Selected for Research Study

The research conducted through the cluster sampling of the total students studying in, situated in Islamabad. The sample population taken for this research was the students of Islamabad studying in 'W' category universities. The sample population was divided into five clusters; i.e. their respective universities [ibid]. The research focused on the café facilities offered on university campuses and the amount of plastic used in those cafes in the form of disposable (one-time use items) plastic utensils used in serving food to the students, specifically and to other consumers in general.

The total questionnaires filled were 105 gathered from these universities at a time when finding in the cafeterias. The time of approaching the students depicts the proportion of the whole population of respondents joining the cafeteria i.e. 12 to 2 pm. The reason behind choosing 105 participants was to adhere to the response and idea of the students and their preferences at a particular specified level to illustrate the major response rate of the universities of Islamabad. It can further evolve and applied to mega cluster sampling by involving other universities as well. The specified number of participants considered as sampling measure. The participation from NUST, NDU, CIIT, Quaid e Azam and NUML, was 21%, 24%, 21%, 17%, and 17% respectively.

The questionnaire consisted of eight questions in total, made on Google Forms. A survey conducted

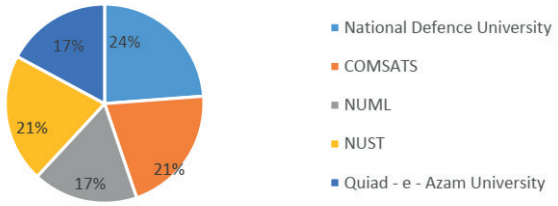

Figure 2. Students Representation from each University

through forwarding the link to the respondents by using the channels of Facebook, Messenger, and Gmail. A significant number of the questionnaire filled through in-person interaction of the researchers with the respondents.

Results and Discussion

The questionnaire formulated the idea of environmental-based behavior of the consumers. It defined with the model of ESF i.e. "The residents of the urban area have a greater level of environmental awareness as compared to the rural residents". The questionnaire included a question concerning their geographic and ethnic background as well [30].

The maximum number of respondents belong to Punjab Province. It is most the most urbanized province of Pakistan. About 13% belonged to the Federal Capital Territory of Islamabad. About 12% of the respondents belonged to Kashmir. About 18%, of the respondents, belonged to KPK. About 13% of the respondents belonged to Sindh. About 18%, of the respondents, belonged to Gilgit Baltistan. About 7%, of the respondents, belonged to Baluchistan respectively.

The target population of this research was the undergraduate and graduate students studying in selected universities. The graph below presents the age-parity among the respondents.

Most of the respondents were undergraduate students pursuing their BS degrees. These students constituted 76% of the respondents of this survey

Figure 3. The Age-Parity among the Students

with the age bracket of 15-25. About 17% of the respondents were in the age bracket of 25 – 35. About 7% of the respondents were in the age bracket of age 35 – 45 years.

The first question was asked regarding the colored plastics and carcinogen impacts of its consumption.

The untreated chemicals such as (I-E) cyanides, mercury, and polychlorinated biphenyls caused due to the enrichment of colored plastics [3]. Hence, it was essential to gauge the understanding of the respondents regarding the consumption of colored plastics and the hazards caused due to its consumption.

About 55% of the total of 105 respondents replied "no" to this question. About 17% out of the total respondents replied "yes" to it. It deduced from the response that most of the respondents' desired to change their consumption patterns and align them with healthy measures ensuring a protected environment.

Figure 4. Students Views about Presence of Cancer-causing Agents in Colored Plastics

According to Lights [8] Bisphenol A (BPA) used in plastics to keep them hard. It has a toxic effect that enters the human body when used. It results in early puberty in girls, premature labor, reduction of fertility in women and physical defects in the newborn babies [ibid]. A further study states that 96% of women in the United States are having BPA [ibid]. The questionnaire included a question concerning the Bisphenol as well. Following responses were the recorded;

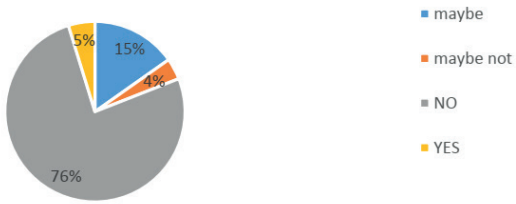

Figure 5. Students Views about Presence of Bisphenol in Plastics and its Impact on Health

After knowing the hazards of the Bisphenol, about 76 % of the total respondents replied "no". It means they were not aware of the toxic impacts of the Bisphenol. Only five of the respondents' replied "yes" that they were aware of the consequences of Bisphenol in plastic to the health of the human being. It concluded that the students studying in the universities are likely to switch from plastic to use other alternatives after knowing the hazards caused by the consumption of Bisphenol.

The toxic materials such as polymers that melt into the food and results in an increase in the percentage of polymers from the same plastic in which the food is packed. This leads to the production of extremely hazardous chemical reactions in the form of BPA, Styrene, and Vinyl Chloride [9].

After becoming aware of the production of hazardous chemical reactions, 70 percent of the respondents were of the opinion that plastic should not be used for the packing of food. About 15 percent of the respondents were of the opinion that plastic can be used for the packing of food. About 15% of the respondents held their opinion reserved.

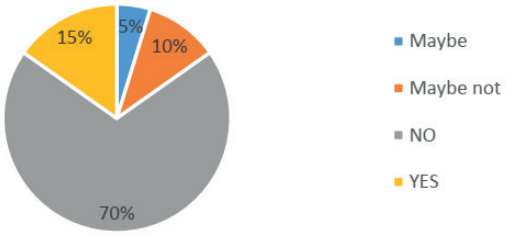

Figure 6. Students Views about Food Containing Containers as a Source of Toxic Material

Furthermore, littering and dumping of plastic material causes the production of heavy materials such as cadmium, lead, dioxin, and other pollutants in the air, water, and landfills [10]. The purpose of including this question (views about food containing sources of toxins) was twofold. Moreover, plastic disposable impacts on the third world are more serious and hazardous due to the mismanagement of non-biodegradable plastic bottles for water, etc. Their consumption is unavoidable in the day-to-day activities and the solution demands a high level of awareness programs.

The developed states ae also ignorant of the societal problems of such facts leading to huge disasters such as floods where the surface water contaminants. This causes a huge threat to human lives and biodiversity [5]. The purpose of including this question (Views about hazardous particles of plastic when not disposed of properly) was to make the respondents realize their responsibility in saving the environment as being a citizen of a developing country. Following was the feedback.

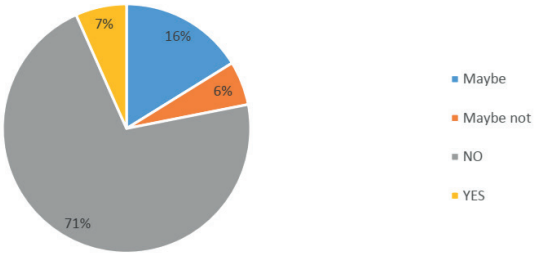

Figure 7. Students Views about Hazardous Particles of Plastic when not Disposed of Properly

About 73% of the total respondents realized their responsibility and replied 'no' to the question where only 8% replied 'yes' to it. These statistics show that upon a change of plastic consumption policy the student body (subjects of the policy) shall welcome the policy change and adapt to the changes made in the offered facilities.

Figure 8. Students Views about Problems of Disposing of Plastic Waste - a Problem of Developing Countries

About 80% of the respondents agreed and showed their likeliness for an environment-friendly policy. Only 11% were not interested in the formulation of such policies. The second last question aimed to aware of the respondents regarding the financial liability of having the environment-friendly facility and the tradeoffs of having an environmentally friendly café facility in contrast to the usage of plastic utensils for the fear of sunk cost fallacy.

Figure 9. Students Views about Substitute for Plastic Utensils

About 73% of the respondents replied 'yes' that the installation of reusable crockery will have a high cost in terms of $. About 14% of the respondents replied 'no' to this question.

Figure 10. Students Views about High Cost of Installation of Reusable Crockery

About 57% of the respondents disagreed with the proposed proposition. Only 9% of the respondents agreed to it. The results of this question prove to stand out as the success of this research work. As the questionnaire was successful in instilling the social responsibility of the respondents and the realization of the harm their consumption brings to the environment.

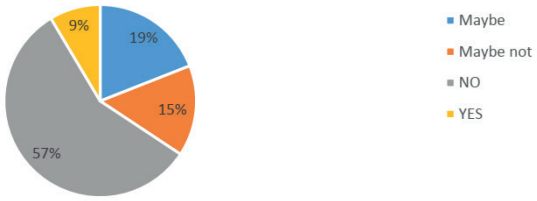

Figure 11. Students Views to Discourage the use of Plastic Utensils

Since the aim of this study was to give essential awareness regarding the environmental hazards caused by plastic consumption and the likelihood of changes in policies towards environmentally friendly frameworks. The response of the students was quite satisfactory.

Eight questions were asked to the students in total. Five of these questions focused on the awareness level regarding general plastic consumption practices and their hazards. The rest of the three questions developed to gauge the probability of creating environmentally-friendly policies in regards to café facilities in universities. The results of the survey pointed out that most of the students agreed with the stance to replace the plastic-based items with crockery and biodegradable packaging material. It means that attitude by the students considered to be PC. They are giving their response to the EA considered as the responsibility of the university head, to put a restriction use of plastic utensils in the cafeteria. It would help to reduce the harmful effects of plastic on the health of the students and other consumers.

Conclusion

Since the methodology used for the research is quantitative and the result is based on the surveys, the authors conclude by connecting the demonstrated attitude of students which is PC according to the ESF and the decision-making process in the universities.

Solely based on the research, the authors' purpose is to clearly provide solid evidences of the harmful effects of the plastics and highlight the awareness of the students regarding the environment and the health impacts from the consumption of plastics utensils.

Knowing the hazardous effects of the increase in usage of plastics in food items, most of the respondents did not appreciate the usage of the plastics. It entails the social acceptance of the negative impact of plastic usage. Therefore, the usage of plastics can be minimized by proposing the usage of plates and other alternatives, which are costly in the short term, but has a positive result for the long term. It reduces the cost as well as the environmental hazards from the society.

The increase in the usage of the plastics would increase diseases like early puberty, stomach diseases, etc. leading to a huge loss in the economy. The hindrance to the abolishment of plastic usage is the administrative responsibility of the authorities in universities. The decision-making is slow at the university level due to a lack of awareness in regards to its consequences and associated high-level short-term interests. The effects of the plastics mitigated from the students by holding up the regulatory authorities (administration) into confidence.

Since the research is intended to stick to gauge the awareness of the students regarding the consumption of plastic utensils and providing tangible evidence to the universities to change their policy of plastic consumption, if using the same ESF framework and develop questionnaires based on it, the research could also investigate students attitude and come up with convincing facts towards other similar environmental policies of the universities.

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Muhammad Sajjad Hussain, Adjunct Faculty Member at Department of Government & Public Policy, National Defense University, Islamabad.
Email: muhammadsajjadhussain41@gmail.com

Muhammad Husnain, Department of Government & Public Policy, National Defense University, Islamabad.
Email: hasnaino.anwari.ir@gmail.com

Syed Talal Raza Shah, International Master of Environmental Sciences, University of Cologne.
Email: syed.talal@hotmail.com