

## **ECONOMIC IMPACT OF SOLID WASTE MANAGEMENT AND PUBLIC HEALTH-RELATED ISSUES IN PAKISTAN**

### **MUHAMMAD NAEEM**

Institute of Research and Information- Mirpur AJK, Pakistan. Email: physiologycardio@gmail.com

### **IRUM NAUREEN \***

Assistant Professor, School of Zoology, Minhaj University, Lahore, Pakistan.

\*Corresponding Author Email: dr.ikumnaureen@mul.edu.pk

### **AISHA SALEEM**

Beijing University of Chemical Technology, School of Life Sciences, Beijing 100029, China.

Email: aishasaleem160@gmail.com

### **ADAB AKHTAR**

GC Women University Sialkot, Pakistan. Email: aadabakhtar018@gmail.com

### **ABDU RAUF**

National Key Laboratory for Tropical Crop Breeding, Tropical Crop Genetic Resources Institute, Chinese Academy of Tropical Agricultural Sciences, Haikou Hainan 571101, China.

Email: abdur-rahf@catas.cn/rauf77@awkum.edu.pk

### **MAZHAR ABBAS**

Beijing Laboratory of Biomedical Materials, Beijing University of Chemical Technology, Beijing 100029, China. Email: mazharabbas503512@gmail.com

### **Abstract**

Solid waste generated by household, commercial and other economic consumption, solid waste handling and final destiny in the environment is very crucial, because its effect on public health can be devastating. The economic consumption behavior of consumers plays an important role in the quantity of solid waste generated. In present study, we analyzed the mode of solid waste generated by consumers and its effect on public health by using a questionnaire and recruiting 200 participants. Furthermore we determined the behavior of moderate and Israf consumers regarding solid waste generation. The aim of this study is to explore the effect of behavior of peoples and impact of Economic Consumption on Solid waste generation. Randomly selecting areas of Pakistan were explored to quantify the data about the waste generating habits, waste generation quantity and waste disposable methods by using a close-ended questionnaire. It was found that the frequency of conscious waste among participants is higher as compared to unconscious waste. It was observed that the frequency of commercial solid waste generated more as compared to household solid waste generated. The Mode of solid waste was studied in the current study and it was found that the mode of solid waste disposal frequency to hand over to collector higher as compared to burning of waste, disposal in streets openly and disposal in streets within bags. It was also found that the burning frequency of waste is more among participants as compared to throwing on dump. Frequencies of different common diseases (asthma, cholera, dysentery, eye infection conjunctivitis and COPD) were observed in the studied area to find out the association of diseases with mode of solid waste generation. It was observed that frequency of typhoid frequency is greater in overall studied area. The Present study explores the mode and behavior of waste generation is a very great risk to health and our environment. The Current study observed that household solid waste generated by moderate consumers and Israf consumer was significantly different as compared to waste generated at commercial places by moderate

consumers and Israf consumers. A Positive correlation of seven types of pollution-related diseases was observed with open waste dumping resident participants.

**Index Terms:** Waste Disposal, Health Hazards, Pollution, Environment, Public Health, Solid Waste Generation.

## 1. INTRODUCTION

Generation of solid waste and its handling and management practices can cause pollution, contamination and diseases. The serious health implications to the local public in the contaminated area can results in fever, cholera, malaria, and other diseases related to the pollution [1]. The disposal method of solid waste matter create in the, air, water and soil pollution and burning or open dumping of solid waste can lead to diseases that can cause morbidity and mortality [2]. Improper segregation of waste and mix-up of municipal and commercial solid waste with hazardous waste during disposal and handling which affects negatively on the health of resident [3]. The community participation in solid waste management is very important to reduce the burden of pollution-based diseases such as fever and dysentery [4]. The population growth, urbanization, industrial processes with high solid waste generation and inadequate solid waste management are risk for public health [5] [6]. The health care waste in the developing countries is not handled and treated properly before disposal, infectious diseases can spread by this [7].

The population of vectors mosquitos increase by improper landfilling and open dumping these vectors cause the transmission of disease [8]. By incorporating environmental values in the consumer's behavior for conscious consumption can lead to the solid waste generation reduction [9]. Mindful consumption can lead to sustainable waste solutions at the individual level which can be waste source separation, recycling and reuse [10]. The participation of individual consumers by conscious consumption can lead to reduction in waste generation, pollution and can be sustainable development [11]. Conscious consumption behavior in fashion industry is environmentally friendly by responsible consumption choices [12]. The Pandemic time made consumers more conscious about consumption and environmental protection approaches in all sectors especially in the food sector [13]. Conscious consumption brings reduction in waste generation, a balance in resource usage and a healthier environment with more sustainability [14].

Treating and behaving responsibly with the environment contains many internal and external drivers in the life of an individual and organization that influence this behavior [15]. These include social, cultural, ethical norms which play crucial role in the responsible sustainable consumer behaviuor [16]. Solid waste disposal methods should be sustainable and eco-friendly, open waste dumping sites pose serious threats to the public in the vicinity, similarly burning solid waste or contaminating it with hazardous acts in the same way. The burning of solid waste causes the emission of harmful gases which are very lethal to public health and the environment itself [17-21]. In Islamic economics, there is system of values and clear guidance about the consumption behaviuor which enhance the environmental sustainability. There is also an emphasis on the environmental protection and green development [22] [23]. The conscious consumption behavior in the

Islamic economics has clear roots with Quran and Hadith [24] [25] [26]. The concept of Israf preserves the environment in Islamic economics by reducing the waste generation [27]. Many factors contribute to the waste generation in households and on the commercial side. Among these family size, income, habits, education and consciousness about the environment are important [28] [29] [30].

The purpose of the current study is to analyze the consumer the role of moderating and Israf doing consumer behavior in the generation of solid waste and tracing the end destiny of the generated solid waste in cities of Pakistan. Secondly to know the impact of generated solid waste on the health of the public in the localities. The study will be helpful for future researchers to conduct more research to minimize waste generation at the consumer level and generate awareness among the public.

## **2. METHODOLOGY**

### **2.1 Study Area**

Questionnaire-based on economic behavior to environmental protection and climatic change consciousness. The questionnaire was distributed randomly in AJK, Punjab, Gilgit Baltistan, Sindh, KPK and Baluchistan. Among 200 participants 101 were involved in commercial activity. The participants were further categorized into moderate consumers (Living within their means and spending consciously, with the intention of minimum waste) and Israf consumers (Spending more sometimes aimlessly without care of waste generation).

### **2.2 Study design**

For the randomly selection of areas, online sources were explored to quantify the data about the waste-generating habits, waste generation quantity and waste disposable methods close-ended questions were used in the questionnaire. To know the nearby industrial solid waste disposal practices, open-ended questions were asked of the participants to assess their locality concerning to industrial waste generation. All the data was compiled, tabulated and undergone statistical analysis. To access the waste disposal practices field surveys were done in Lahore and Sialkot to report the undisposed waste in the environment.

### **2.3 Instrument of study**

To observe the waste destiny in the environment, to observers we randomly visited Sialkot, Kasur and Lahore, reported he streets, commercial sites and industrial areas. Data were record of waste generation, handling and their destiny in those localities. Based on this analysis we find out the flow of waste in the environment.

### **2.4 Ethical consideration and consent**

Ethical consideration was also considered. Consent was taken from all the participants. Privacy and confidential information were also ensured. The collected data was stored along with Questionnaires' forms of consent with confidentially.

## 2.5 Data Analysis

The collected data were compiled in MS Office Excel sheets. To identify the waste density in the environment to observers randomly visited Sialkot, Kasur and Lahore, reporting the streets, commercial sites and industrial areas.

## 3. RESULTS

### 3.1 Field Observations

Randomly visiting Kasur (Punjab), Lahore (Punjab) and Sialkot (Punjab) streets, markets and industrial areas, pics collected from waste generated to handling practices. However, from other regions Kotli (AJK), Sui (Baluchistan), Malakand (KP), Karachi (Sindh), participants were requested to visit the locality and report the area from waste generation to handlings. A common summary of all pictorial files is given in the diagram below. From household, commercial and industrial level waste generated is not segregated. The multiple dustbins are just for symbolic purposes. Mostly waste goes to open dumping sites directly by consumers or indirectly by the waste collectors. Waste is burnt at the dumping sites and individual levels in the street corners or in front or behind the homes. Waste from the open dumping goes in to the local sewerages and causes blockages. Industrial waste goes into the water or is burnt or handed over to the collector. The 200 participants reported on the average each had 4-5 open dumping sites and within the last 90 days each participant observed sewerage blockage in near locality 3-8 times. The participants reported dust and smell in the air due to these open sites and waste burnings.



Household & Commercial Solid waste generated



Unsegregated Household & Commercial Waste on open waste dumps





**Figure 1: Regardless the source of waste generation, either in households, commercial, livestock or industrial the end destination is same. The waste directly or indirectly through waste collector goes on the open dumps or is burnt or in water**

### 3.2 Waste Generated by Economic Consumption

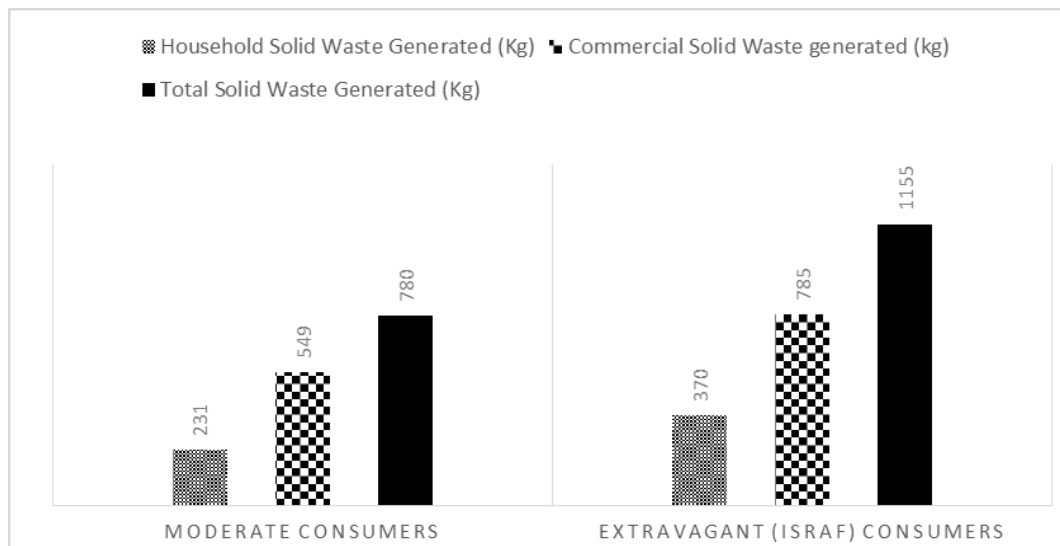
**Table 1** below is shows the economic consumption behavior of 200 participants in households and their commercial places. Moderately consuming participants generated 457 Kg of households and 1137 Kg of commercial waste. On the other hand, extravagant (Israf) consumers generated 549Kg in household and 785Kg at the commercial place. The average family size of each participant was considered 5 members. The income range of the 101 participants was nearly the same. The participants were selected randomly across the Pakistan both from rural and urban areas.

### 3.3 Comparison between Household Waste Generated:

A T-test between household waste generated by moderate consumers and Israf consumers ( $n=101$ ) was performed to determine know the difference in waste production. The  $t$ -value is -7.38006. The  $p$ -value is  $< .00001$ . The result is significant at  $p < .05$ . The results show that there is difference in the waste generation in moderate consumption and Israf consumption behavior.

### 3.4 Comparison between Commercial Waste Generated:

The t-test was performed to compare the differences in the waste generated at commercial places by the same 200 Participants consuming in differently way. The  $t$ -value is -4.88317. The  $p$ -value is  $< .00001$ . The result is significant at  $p < .05$ . The waste generated at the commercial places by the moderate consumers and extravagant consumers were significantly different. The t-test performed between the total waste produced by the moderate consumer and Israf consumer also shown a significant result. The  $t$ -value is -6.77979. The  $p$ -value is  $< .00001$ . The result is significant at  $p < .05$ .

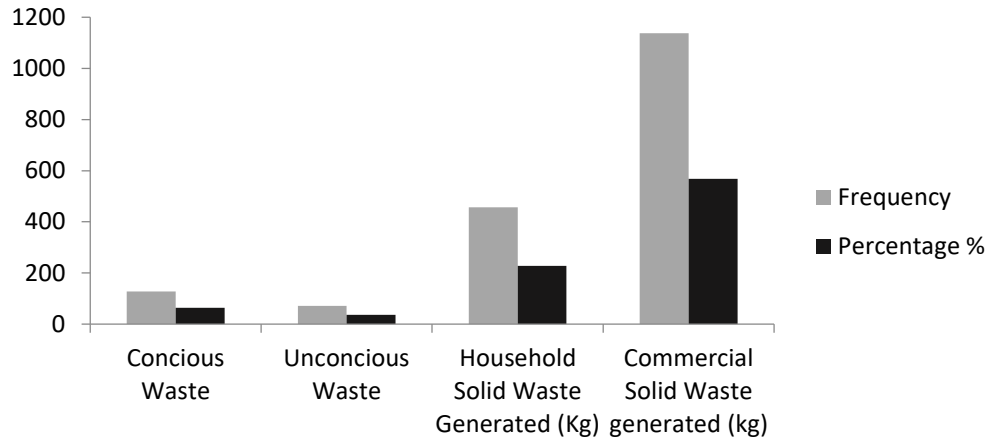


**Figure 2: The t-test performed between the total waste produced by the moderate consumer and Israf consumer also shown a significant result. The  $t$ -value is -6.77979. The  $p$ -value is  $< .00001$ . The result is significant at  $p < .05$**

**Table 1: Types of waste generation in different Areas of Pakistan**

Types of solid waste	Frequency	Percentage %
Conscious Waste	128	64
Unconscious Waste	72	36
Household Solid Waste Generated (Kg)	457	228.5
Commercial Solid Waste generated (kg)	1137	568.5

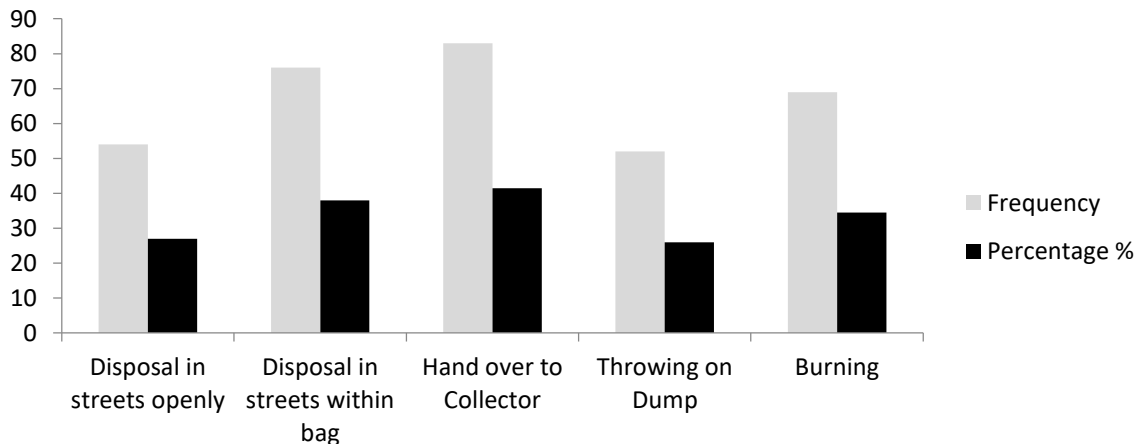
The quantity of the waste generating habits and quantity of waste disposable by using close methods to used ended questionnaire. It was found that the frequency of conscious waste among participants was higher as compared to unconscious waste. It was observed that the frequency of commercial sold waste generation more as compared to household solid waste.



**Figure 3: Comparison of conscious waste and unconscious waste, which frequency of commercial sold waste generated more as compared to household solid waste generated**

**Table 3: Mode of waste disposal**

Mode of waste Disposal	Frequency	Percentage %
Disposal in streets openly	54	27
Disposal in streets within the bag	76	38
Hand over to Collector	83	41.5
Throwing on Dump	52	26
Burning	69	34.5



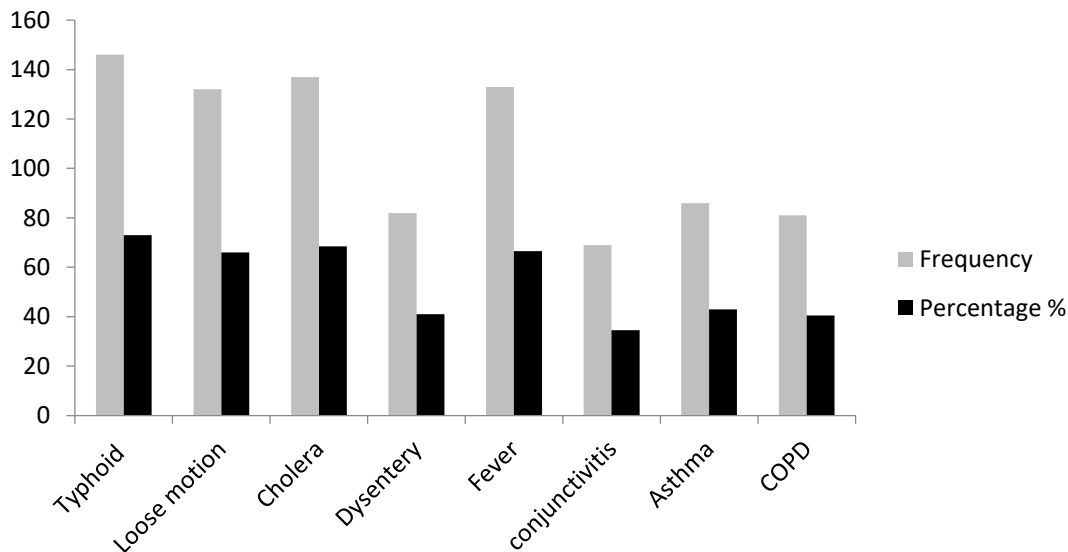
**Figure 4: Comparison of mode of solid waste disposal frequency to hand over to collector higher than burning of waste disposal in streets openly, and disposal in streets within bags. The burning frequency of waste is more among participant as compared to throwing it in the dump**

### 3.5 Diseases in the Solid Waste Polluted Localities

**Table 4** is shows the impact of mishandled waste on the local population. The common disease types considered were typhoid fever, sand-fly fever, asthma, cholera, dysentery, COPD, eye infection. Each participant responded to types of pollution-related diseases in the locality when sewerage blockage occurred in the last 90 days as per the participant's memory. At the presence of open waste dumping and sewerages in the locality, the intensity of Cholera, Dysentery and typhoid is noted to know the relationship with solid waste pollution on the local population concerning to these three diseases. The data was recorded by the 200 participants randomly across Pakistan both in rural and urban areas.

**Table 4: Distribution of the studied sample's behaviors on waste disposal to concerning diseases caused by waste in Pakistan**

Diseases	Frequency	Percentage %
Typhoid	146	73
Loose motion	132	66
Cholera	137	68.5
Dysentery	82	41
Fever	133	66.5
Conjunctivitis	69	34.5
Asthma	86	43
COPD	81	40.5



**Figure 5: Comparison of frequencies of different common diseases Typhoid Loose Motion Asthma, cholera, dysentery, Fever Eye infection conjunctivitis and COPD. The association of diseases with the mode of solid waste generation typhoid frequency is greater than the others**



### 3.6 Correlations

#### **Relationship between common occurring disease types and open dumping waste sites**

The Pearson correlation was performed to find out the relationship between the common occurrence of disease types and open dumping places in the locality. The value of  $R$  is 0.2762. Although technically a positive correlation, the relationship between commonly occurring diseases and the open dumping waste site is weak. The value of  $R^2$ , the coefficient of determination, is 0.0763. The  $P$ -value is .000076. The result is significant at  $p < .05$ . A weaker positive relationship indicates that disease types which are caused by pollution are present in the locality. However, the intensity of each depends on the type of pollution and this needs to be researched separately to find out the more direct relation of each pollution related disease in the locality.

#### **Relationship between Cholera, Typhoid, and Dysentery cases in the locality and with open dumping sites and sewerage leakage**

The Pearson correlation was performed to find out the relationship between Cholera, Dysentery and Typhoid with open dumping sites and sewerage leakage intensity. The value of  $R$  is 0.6944. This is a moderate positive correlation, which means there is a tendency for high open dumping and leakage scores to go with high cholera, dysentery and typhoid scores (and vice versa). The value of  $R^2$ , the coefficient of determination, is 0.4822. The  $P$ -Value is  $< .00001$ . The result is significant at  $p < .05$ . This moderate positive relationship shows that cholera, dysentery and typhoid are mostly caused by the open dumping sites and sewerage leakage in the locality.

### 4. DISCUSSION

The difference in the solid waste generation between moderate and Israf consumers is due to their different patterns of consumption, Israf consumers are characterized by their excessive consumption [31]. Moderate consumers consciously try to live within their means and intent to minimize the wastage of their resources, which leads to low waste generation, making good impact on the environment and quality of life [32]. The level of awareness among consumers about the environment also plays a vital role in waste reduction, similarly local legalization in the different parts of the world also play a role in sustainable consumption [33]. The concept of moderation and Israf consumption is mostly in theoretical discussions in the literature, there is a need to provide a real-life economic data on this consumption behavior [34]. Our study provided a real-life data example of solid waste generation under moderation and Israf consumption behavior.

In the present study it was found that the frequency of conscious waste among participants higher as compared to unconscious waste. It was observed that the frequency of commercial solid waste generated more as compared to household solid waste generated. The modes of solid waste were studied in the current study and it was found that the mode of solid waste disposal frequency to hand over to collector higher as

compared to burning of waste, disposal in streets openly and disposal in streets within bags. It was also found that the burning frequency of waste is higher among participant as compared to throwing it on the dump. The previous studies, [35] showed that 18.3% of homes disposed of plastic products as waste and 74.3% of households disposed of food debris. Additionally, the study revealed that while 49.7% of the families did not separate their garbage, 50.3% of them did. In the previous study [36] examined household disposal practices and harm resulting from solid medical waste (SMW) generated in households and the community. 600 questionnaires household survey found that 89% and 23% of respondents discarded unwanted medicines and sharps in refuse bins, respectively. The household and in the community were reported by 5% and 3% solid waste. The presence of unwanted medicines and sharps in the household waste stream confers hazardous properties.

Frequencies of different common diseases (asthma, cholera, dysentery, eye infection conjunctivitis and COPD) were observed in the studied area to find out the association of diseases with the mode of solid waste generation. It was observed that frequency of typhoid frequency is greater in the overall studied area. In the earlier studies [37] similar study conducted on solid waste management and economic consumption semi-structured questionnaire as part of a cross-sectional descriptive sample of 400 respondents. Wastes from the household: vegetables, ash, rags and clothes, wood, and animal waste cause different diseases diarrhea (23.9%), lassa fever (10.7%), malaria (47.2%), and cholera (18.2%). The association of disease causes waste disposal on dumping sites. The Present study explores the mode and behavior of waste generation is a very great risk to health and our environment. The Current study observed the household solid waste generated by moderate consumers and Israf consumer was significantly different as compared to waste generated at the commercial places by moderate consumers and Israf consumers. A Positive correlation of seven types of pollution-related diseases was observed with open waste dumping resident participants.

There is a need for sustainable solutions to resolve the issue of solid waste generation in Pakistan, per capita solid waste production in Pakistan is 0.170 to 0.62Kg with a remarkable growth rate, studies indicate Pakistan generate millions metric tonnes' of solid waste on daily basis [38-39]. Household and commercial solid waste contributes large quantities in waste generation across country, multiple factors in the families' affect the solid waste generation [40]. The solid waste handling practices in the rural and semi-rural areas of Pakistan need attention causing environmental degradation and health problems in the public [41]. There is a need to understand waste generation and handling behaviors of the consumers for interventions to promote the sustainable waste management at the individual and household levels [42].

## 5. CONCLUSION

The results of the present study specify the effect of economic consumption on solid waste generation in Pakistan. A Major focus is on open dumping areas and burning sites

in different localities of Pakistan. It also specifies the further rise in the health risks associated with solid waste generation mainly the frequencies of Typhoid Loose Motion, Asthma, cholera, dysentery, Fever Eye infection, conjunctivitis and Chronic obstructive pulmonary disease (COPD). A Positive correlation of seven types of pollution-related diseases was observed with open waste dumping resident participants. The present study explores the risk of mode and behavior of waste generation for health and our environment. The proper strategy of waste disposal is necessary to decrease environmental and health issues.

### Limitations of Study:

Our data is based on the primary information provided by the respondents; there is a need to collect data from the health department about the actual reported cases of pollution-related diseases in the multiple regions of Pakistan and to correlate with the local environmental pollution in air, soil and water.

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