



## Uncovering Traditional Ecological Knowledge-based Behaviours in Modern Households: A Qualitative Study from Urban Pakistan

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### Abstract

Traditional ecological knowledge (TEK) has been established as a valid contributor to environmental preservation in indigenous societies. Scholars have expanded upon this significance to benefit urban and rural ecologies, with most work being done in rural and geographically remote contexts around the world. In the urban context, academics have employed TEK predominantly to societal landscapes, including city planning, architecture, and ethnobiology. Scant attention has been paid to TEK manifestation in urban individuals' lifestyles. Our research catalogues urban household TEK practices, by studying modern-day individuals in metropolitan Karachi - Pakistan, through a qualitative study design through thematic analysis. Data was collected through 21 in-depth interviews of affluent and highly educated professionals, to document behaviours of a conventionally non-traditional respondent segment. Findings demonstrated a clear presence of TEK-based behaviours in modern urban individuals. These behaviours manifested in two types of perceived advantages: environmentally beneficial, and personally beneficial. This study is among the first to explore the adoption of TEK by urban individuals for environmental conservation and answers the call for making TEK more inclusive to address current environmental challenges.

**Keywords:** Traditional ecological knowledge, pro-environmental behaviours, environmental conservation, urban households, indigenous wisdom.

### Introduction

A growing realization of the compounding environmental degradation has prompted scholars to explore ancient traditions of the indigenous people in search of unorthodox solutions to mitigate the environmental problem in ways that complement the Western scientific methods of today. Extensive work has been conducted on traditional knowledge and wisdom of the native people in different parts of the world in the domain of ecology. Noteworthy examples are studies on the ancient living practices of the indigenous people of Canada (Brauer, 2017), the aboriginal groups in Australia (Nurse-Bray et al., 2019), and the Tsimane people of South America (Paneque-Galvez et al., 2018). Similar literature from the South Asian region suggests that researchers have directed their attention to examining various ancestral ecological practices in an effort to identify environmentally friendly traditional practices. Evidence includes academic work on the Himalayan communities in India (Ingty, 2017), northern Iran (Ghorbani et al., 2013) and rural China (Yang et al., 2019). However, the focus of such research has been centred mostly

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around the customs of rural populations.

Pakistan sits at the geographical confluence of several historic traditional cultures. These traditions stretch from the 5,000 BCE influences of the Indus valley and Gandhara civilizations, to the Vedic, Muslim, and British legacies, to modern lifestyles of today. The trickling down of this fertile heritage through millennia has resulted in unique tradition-based practices scattered throughout the fabric of this society, which have helped communities live conciliatingly with nature in this region. People have adopted orally transmitted traditional habits of their forefathers across multifaceted ecological spectrums, ranging from personal health and wellness routines (Ramzan et. al, 2017), to communal agricultural practices (Qasim et.al, 2019). This traditional wisdom has been passed down intergenerationally, and still appears to exist in most tribal and rural societies, as is evidenced by studies in ethno-medicine (Altaf et al., 2020), ethnobotany (Yaseen, 2019) and ethno-veterinary (Aziz et al., 2020).

### **Rationale for the Study**

Despite the importance of learning from traditional practices to counter modern environmental problems, scholars have paid scant attention to exploring the adoption of these practices in modern urban societies. There exists some anecdotal evidence that suggests the presence of traditional practices in urban societies within Pakistan. This fact is catalogued primarily through informal evidence in the form of common household practices, folk stories, and popular fiction. However, a formal investigation into the level of entrenchment of traditional wisdom-based practices within modern day Pakistan appears to be lacking from established scientific literature. This study endeavours to investigate the presence of traditional behaviours in urban Pakistan, in an effort to bring traditional ecological knowledge based (TEK) urban behaviours into academic light. Throughout this paper, the term *Traditional Ecological Knowledge* shall be referred to as *TEK*.

### **Literature Review**

#### **Traditional Ecological Knowledge**

For the purpose of this study, the discourse is based upon the definition of TEK by Berkes (1993), which states that '*TEK is a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment*' and further describes it as '*an attribute of societies with historical continuity in resource use practices*'. Looking through the lens of this definition, researchers have historically approached the subject of traditional knowledge from the angle of sustainable resource use practices of indigenous communities, while studying communal and individual behaviours. Berkes (2017) explains traditional knowledge as bodies of knowledge that are preserved by indigenous communities living in tribal and rural, generally geographically remote locales around the world. This type of knowledge is passed down intergenerationally and benefits the ecology of their habitat by utilizing natural resources in sustainable manners. A growing genre of recent research is dedicated to examining the success of these ancient methods in preserving the environment, in a manner that has enabled these groups to beneficially cohabit with their natural surroundings for millennia. Climate change mitigation, agrarian customs, fishery advice and an extensive use of traditional flora and fauna in their daily lives are a few domains



where the study of traditional indigenous knowledge has enriched academic understanding of heritage-based ecology.

Extant literature has also touched upon another aspect of traditional knowledge: the fact that it is decreasing in indigenous people get entrenched in part of modern societies. Aswani et al. (2018) illustrate this fact in their research review, studying the traditional customs of indigenous communities around the world. Results of the analysis depict a decline in local and indigenous practices globally. 77% of reviewed articles reported that knowledge was lost due to increased globalization and market integration in various economies. The maximum loss faced was found in the areas of ethnobotany and traditional medicinal knowledge.

### **Traditional Knowledge & Environmental Contexts**

A growing body of research is focused upon exploring how indigenous and modern scientific knowledge are not contradictory. Both use empirically measurable experiments as their basis for creating knowledge; and both rely on rational thought process of creating order from chaos in search of tangible solutions (Maweu, 2011). Where they may differ is in the domain of intangible motivations and understandings which are culturally transmitted as rationales for indigenous knowledge. Nonetheless, the logical problem-solving nature of both make them complimentary approaches.

This has led to an interest in traditional knowledge by bringing the effectiveness of indigenous practices across various domains into academic light. Preserving biocultural heritage (Lindhom & Ekblom, 2019), forest management (Sierra-Huelsz & Fernandez, 2020) and management of water resources (Milshina & Pavlova, 2020) are just a few examples. These examples cater to the growing need to compliment scientific knowledge in modern societies with lessons from traditional knowledge to find a wide-ranging solution to the global environmental degradation (Bleys et al., 2018). Work by Belldina (2020) presents another example advocating the efficacy of traditional knowledge systems as viable solutions to mitigating climate change and environmental degradation. These problems include the issues of increased land, air and water pollution, soil erosion, deforestation, melting polar ice caps, and increasing desertification. A reliance on western scientific methods is seen to be lacking environmental mitigation efficacy. As a consequence, research on traditional knowledge has moved to study urban greening, ethnobiology and biocultural diversity in city centres (Buizer et al., 2016). Nonetheless, there exists a gap in literature that caters to the environmental impact of individuals' traditional behaviour in urban locales.

### **Local Relevance in Traditional Ecological Knowledge Contexts**

#### **Traditional Knowledge in the Communal Context**

On the communal front, studies within Pakistan have touched upon the prevalent use of traditional ecological practices in various agricultural domains. In their study, Kazmi et al. (2014) explored traditional farming practices and found that farmers relied on traditional knowledge for higher production during seasonal cultivation cycles. A study by Qasim et al. (2019) explored the revival of traditional Karez irrigation practices in the province of Baluchistan as a direct contemporary application of traditional wisdom; while another research by Saghri et al. (2019) discussed the reliance on indigenous methods of biofuel generation in the agricultural lands of Pakistan based on ancient ecological knowledge.



### **Traditional Knowledge in Medicinal and Personal Care Contexts**

Similarly, but on an individual scale, studies like those by Ramzan et al. (2017) and Anwar et al. (2015) have explored the use of traditional medicine, therapeutics, and home remedies within individual Pakistani households. Their discourse acknowledges that a number of respondents in Pakistan reportedly adhere to traditional remedies frequently. Ramzan et al. (2017) have also touched upon the reasons behind adopting traditional behaviours, as their study cites family tradition and faith in old ways as the main variables that influenced their actions. A substantial body of knowledge exists in Pakistan which studies medicinal properties of various plants and herbs for their pharmacological benefits (Younis et al., 2018; Yaseen et al., 2019). Nonetheless, a continued prevalence of traditional customs among Pakistani individuals belonging to varied spheres of life is lacking and merits a deeper study into the motivations behind these actions.

### **Traditional knowledge-based Practices in Rural Settings**

The communal and individual practices studied within the context of Pakistan share the common thread of utilizing natural resources for contemporary problem solving, albeit in rural societies only. By and large, research on traditional ecological wisdom and its applicability in today's life remains bound to rural and geographically remote societies, not just in Pakistan but around the world. According to Berkes (2017), these practices have been prevalent in mostly '*non-industrial or less technologically oriented societies, many of them indigenous or tribal*'. Existing literature has catered to ecologically beneficial local customs of indigenous dwellings in multiple fields, in rural and geographically remotely communities (van Vliet et al., 2018; Phungpracha et al., 2016; Tang & Gavin, 2010).

In Pakistan, researchers like Ullah et al. (2019) and Abbas et al. (2017) have investigated traditional knowledge-based practices of the tribal and rural people of Khyber Pakhtunkhwa and Baltistan regions. This stream of knowledge, though valuable, fails to address the presence of traditional knowledge in modern lifestyles of urban individuals.

### **Traditional Knowledge in Urban Settings - Societal**

Insofar as research on traditional ecology in urban contexts is concerned, a confluence of indigenous ecological knowledge and urban living is seen in various fields, like studies on city planning (Yli-Pelkonen & Kohl, 2005), architecture (Kirbas & Hizli, 2016) and ethnobiology (Emery & Hurley, 2016). However, traditional influences on everyday ecological or pro-environmental behaviours of urban dwellers in contemporary, non-indigenous societies remains understudied. As noted by Berkes (2017, p 8), *some* non-indigenous groups do hold traditional ecological wisdom, in the sense of culturally transmitted knowledge; nonetheless research on these groups is limited.

### **Categories of TEK Identified in Literature**

Researchers have categorized various TEK based practices in the mitigation of environmental problems around the world. Oben et al. (2019) study traditional knowledge through the lens of reuse, recycling and reduction of plastic waste in the coastal zones in Cameroon; Grzywacz et al. (2014) discusses the importance of indigenous knowledge in reducing chemical use for pest control in Africa; a report by the World Health Organization (2019) recognizes traditional medicine as a complimentary therapeutic medicinal category.



Within Pakistan, abundant anecdotal evidence in the form of individual experiences, observations as well as from folklore is found in sustainability and environmental behaviour literature that alludes to the presence of traditional wisdom-based behaviours within modern, urban households. These have included concepts like reducing food waste and composting (Imtiaz, 2019); and making use of locally available ingredients for personal care and home maintenance purposes (Sheikh, 2018), among others. Nonetheless, there exists insufficient scientific cataloguing of these behaviours within the local perspective- especially those that seem to be incongruent with the modern scientific world of today.

### **Research Objective and Research Questions**

In light of the evidence presented, there exists a gap in scientific literature that points to the lack of academic attention towards exploring the presence of traditionally transmitted knowledge within modern lifestyles of urban individuals, in a non-Western society. Therefore, the main objective of this qualitative study is to enhance understanding of traditional ecological knowledge-based behaviours currently in practice within modern urban settings in Pakistan. Towards this end, we formulated and analysed responses to three broad-based questions for our research:

1. Are traditional ecological knowledge-based behaviours prevalent in modern, urban households?
2. If present, what motivates respondents to adopt these behaviours?
3. Also, if present, do these practices correspond to the conventional ecological behaviour typologies prevalent in Western scientific literature?

### **Limitations & Delimitations**

Methodologically, the authors acknowledge the limitation of using self-reported environmental behaviour measures, as recognized by Langenbach et al. (2019). Additionally, temporal and spatial constraints bounded the scope of the study to one geographical location. Hence, a broader understanding of the phenomenon under study requires future exploration in other regions as well. Additionally, the theoretical ambit of the current study is delimited to exploring TEK-based practices that yield real or perceived *tangible* benefits for the target population. Therefore, reported behaviours with religious or spiritual reasonings were considered outside the scope of this research.

### **Methodology**

#### **Theoretical Underpinnings & Research Design**

This study uses an inductive qualitative approach for data analysis, based upon the conceptualization of Seamon & Gill (2016). According to them, qualitative research is the most appropriate approach for studies seeking to examine real life situations of individual in real time and place. This approach draws its efficacy from the rich experiences narrated by people as they expound upon their life situations and attach meanings to experiences. Hence, a study of lived experiences positions this study under the phenomenological theoretical umbrella. Translating this philosophy into a workable research methodology, Gadamer (1998) stressed the importance of interpretation of experiences through common languages through which experiences are lived,



shared and understood between the interpreter and meaning in text, by stating that ‘language is the universal medium in which understanding occurs. Understanding occurs in interpreting’ (p.389). To this end, the current study seeks to study the lived experiences of urban individuals as they experience environmental degradation and try to mitigate it through reliving traditional knowledge-based practices learnt through their ancestors. As a qualitative endeavour, this study attempts to gain deep insight into respondents’ lived experiences through in-depth bilingual interviews, and try to uncover unnoticed themes and connections, and knit them in the form of cohesive understandings.

### **Sample Selection**

The main purpose of this study was to examine traditional behaviours within contemporary urban response groups that are popularly considered as non-indigenous/non-traditional. Hence, it was vital to delineate respondent characteristics. We have chosen to focus on only the demographic categorization of urban residents, and value/attitude-based segregation is out of scope for the current study. Hence, for the purpose of this research adult respondents were chosen based on the demographic characteristics of 1) length of residence in urban neighbourhoods in Pakistan, 2) high socioeconomic status, and 3) high education level. Efimov et al. (2015), in their study on urban Russia, note that traditional cultural practices lose their relevance for second generation city dwellers. Hence, for the purpose of this study, those respondents were chosen who had lived in urban dwellings for at least two generations consecutively, to try to mitigate the residual habitual effects of rural customs still prevailing in first generation urbanites, in order to look for consciously chosen traditional habits. Furthermore, according to Sevincer et al. (2015), desirable characteristics of pro-environmentally responsive urban dwellers include high education levels, as well as belonging to middle and upper economic classes, and those with easy access to modern media and technology in their everyday lives. Therefore, keeping these criteria in mind collectively, respondents were first selected through *purposive sampling* from the affluent residential area of DHA in Karachi, the largest metropolitan city of Pakistan. First point of respondent recruitment was lecturers and professors from two universities in Karachi - Iqra University and Bahria University, to ensure selection of highly educated individuals. A *snowball sampling* technique was subsequently used to recruit further respondents, which yielded the desired number of people willing to take part in this study. A total of 32 individuals were identified and contacted, out of which 24 consented to participate. A short demographic survey revealed 3 to be unfit for this research (2 did not meet the residential criteria, 1 did not meet the education criteria), resulting in a sample size of 21 participants, belonging to five distinct ethnicities.

The demographic makeup of the respondents is summarized in Table 1.

### **Study Design**

This research employed a qualitative methodology through thematic analysis, in order to gain meaningful understanding and appreciation of the participants’ knowledge, experiences and motivations behind the phenomenon under study (Thyer, 2001). Respondents were asked to participate in face to face, individual interviews to share insights into traditional behaviours practiced in their everyday lives. The interviews were conducted in neutral settings, in the presence of one interviewer, a moderator and a notetaker. Prior consent to videotaping and audio recording the sessions was obtained, and all respondents were made duly aware of their ethical rights as subjects of a behavioural study in writing.

**KASBIT Business Journal, 14(2), 14-36, June 2021**

For conducting the interviews, a semi-structured interview guide was prepared, in keeping with the recommendations of Kleinman (1978). The guide was prepared in English and tested through two test interviews. Feedback indicated that respondents felt more comfortable while employing a mix of both English and Urdu languages for a more candid experience, and subsequent interviews were structured utilizing both languages. Interviews were transcribed verbatim for English and translated where Urdu was used. It is pertinent to note, however, that most of the responses were in English, and respondents used Urdu phrases primarily while referring to traditional household remedies and tips in local parlance, as passed down to them by their ancestors.

According to researchers like Guest et al. (2006), data or information redundancy is reached when the researcher starts to record the same information repeatedly from new interviewees. Narrowing the definition further, Legard et al. (2003) refer to data redundancy on an individual level when further interviewing a single respondent reaches the point of saturation whereby no new information is forthcoming. The present study utilized both concepts in tandem, and found that after conducting 21 in- depth interviews, no new information emerged beyond the 18th participant. Hence, it was decided that data saturation had reached, and no further data gathering would be useful. Additionally, the optimum length of individual interviews was found to range between 30-40 minutes, after which information redundancy was observed. Overall, 21 respondents from the metropolitan city of Karachi were interviewed.

**Table 1: Participant Demographic Data**

<b>Participant ID</b>	<b>Gender</b>	<b>Age</b>	<b>Ethnicity</b>	<b>Education</b>	<b>Profession</b>
P1	F	29	Sindhi	Masters	Lecturer
P2	F	40	Urdu	Masters	Lecturer
P3	F	39	Speaking Urdu	Bachelors	Housewife
P4	F	39	Punjabi	MBBS, FRCPATH	Pathologist
P5	M	42	Punjabi	PhD	Professor
P6	F	33	Urdu speaking	MBA	Banker
P7	F	37	Memon	MBA	Banker
P8	F	43	Sindhi	MBA	Banker
P9	M	30	Sindhi	MBA	Banker
P10	F	28	Memon	MPhil	Lecturer
P11	F	37	Sindhi	Masters	Lecturer
P12	F	33	Memon	Masters	Housewife
P13	M	35	Urdu speaking	MPhil	Lecturer
P14	F	34	Pathan	MBBS, FRCR	Radiologist
P15	F	27	Sindhi	Masters	Teacher
P16	F	35	Pathan	MPA	Admin Officer
P17	F	26	Punjabi	Bachelors	Airline Worker



P18	M	31	Urdu speaking	MBA	Marketing Manager
P19	M	40	Memon	PhD	Professor
P20	F	45	Punjabi	MBBS, PhD	Professor
P21	F	33	Sindhi	Masters	Housewife

To aid informants about TEK-based practices under study, the research team compiled a list of behaviours based on scientifically documented rural traditional practices in Pakistan as a reference guide, as recorded by Ramzan et al. (2017) and Anwar et al. (2015) in their studies. It also included behaviours recorded through anecdotal evidence of folklore, storytelling, and popular cultural practices to spearhead discussions, as these sources are considered valid sources of indigenous knowledge by Crowshoe (2005). Dialogue with the participants centred around 1) identification of TEK-based behaviours they currently practice; 2) the benefits and challenges of adopting these behaviours; and 3) an insight into their personal motivations behind adopting TEK based measures.

### Data Analysis

The qualitative data was analysed through an in-depth thematic analysis, as suggested by Braun and Clarke (2020). In line with this approach, analysis underwent the following processes:

**Identification:** Interview transcripts were read through multiple times for data familiarization. Initial codes were assigned to data points, and linkages were made between data and literature.

**Analysis:** Codes were collated against each block of individual data, and equal attention to all data blocks was ensured. During this stage, care was taken to assign mutually exclusive codes to phenomenon of interest, which then became basis for larger themes and subthemes. As an example, all codes relevant to *composting* were labelled, and grouped together under one theme *zero food waste*. The themes and subthemes are discussed in detail in Table 2.

**Organization:** Themes identified were refined for exclusivity and relevance into coherent meaning patterns, which were referred back to the raw data to ensure that all meaning units were grounded in actual data.

**Description & Reporting:** At this stage, rich descriptions of each unit of interest were generated. These were recorded using direct long and short quotes from the interview transcripts for a rich analysis and are discussed in the next section.

Data analysis was undertaken using manual coding and categorizing to identify themes, as suggested by van Manen (2014). In addition to verbatim transcription of responses in English and translation of Urdu phrases, observer notes were also part of data analysis.

## Results

### Urban TEK Identification and Categorization

From in-depth interviews of urban respondents with a variety of ethnic backgrounds, a broad spectrum of TEK-based practices was identified and categorized. Based on their life experiences, virtually all interviewees acknowledged the presence of traditional habits in their everyday lives. These varied from health and wellness practices, to resource conservation methods to superstitious rituals. In specific cases, respondents self-categorized certain behaviours, whereas in others, participants identified a variety of practices, without correlating them to modern ecological behaviour categories. Figure 1 summarizes category-wise TEK-based practices identified by non-traditional, urban respondents.





Based on gathered data, identified traditional practices were categorized into three broad characterizations 1) TEK-based behaviours with environmental benefits, 2) TEK-based behaviours with personal benefits, and 3) TEK-based ritualistic behaviours. The following sections elaborate on this typification in greater detail.

### **TEK-based Behaviours with Pro-Environmental Benefits**

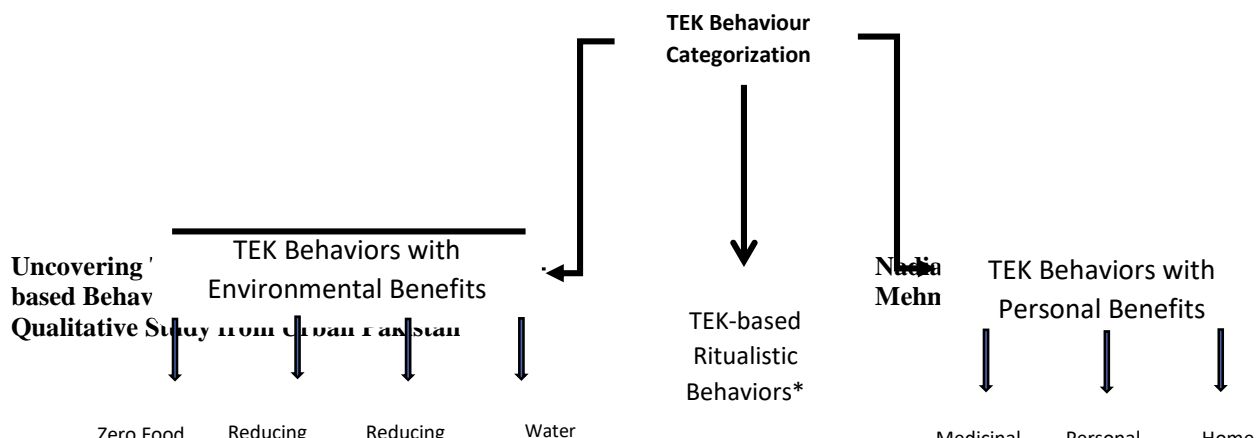
Detailed dialogue with participants revealed the presence of a TEK-based behaviour category where participants reported performing traditionally transmitted actions to actively confront the current environmental problems. Seemingly counter-intuitive, this category sees respondents from modern, non-indigenous households combining old wisdom-based practices of their ancestors to address contemporary environmental problems of urban living today. A significant majority of participants (n=19) narrated consciously choosing a variety of behaviours that benefit the environment from methods taught by their elders. These included habits encouraging composting, reducing food waste, reducing use of chemicals, reducing plastic use, and resource conservation. It becomes noteworthy to state here that most of the practices catalogued under this characterization were self-categorized by the respondents as pro-environmental behaviours. However, the respondents acknowledge that their ancestors may have adopted these practices for other purposes as well. The underlying thread common throughout this discussion was the conceptualization of ‘being one with the land’. While narrating the traditional practices of their elders, respondents quoted phrases like ‘*mitti sey aaya hai, mitti main jaega* (If it has come from the earth, it should be returned to the earth); considering *dharti* (earth) as *Maa* (mother); referring to themselves as *dharti kay baitay* (sons of the soil).

This section discusses these characterizations in detail.

### **Zero Food Waste & Compost**

Every participant who acknowledged using environmentally beneficial TEK behaviour (n=19) reported actively endorsing measures that seek to reduce food waste. Gender of respondents was not found to influence the practice of this type of behaviour, unlike that noted in TEK adoption for personal benefits. Responses were definitive and emphatic, and often contained advocacy for propagation of these measures for reducing waste. Some samples from participant feedback in this category are recorded as under.

*‘My grandfather always used to say, Mitti sey aaya hai, mitti main jaega. (If it has come from the earth, it should be returned to the earth). So, for example, all fruit and vegetable waste, leftover bread and rice etc. are always buried in the backyard. We don’t consider throwing any little scrap of food into garbage.’ (Female, 39, pathologist)*





**\*Ritualistic Behaviours are outside the scope of this study**

**Figure 1: Traditional Ecological Knowledge-based Behaviour Categorization**

*'Wasting food is almost considered a crime in our household. All leftover food must be fed to birds or cats or dogs or even ants. Our grandparents taught us that the place of every scrap of food is in a belly, not the garbage.'* (Male, 42, professor)

*'We only have finite resources. In a country with our resources and our population, each little bit of food matters. My mother and grandmother taught us ways of maximizing what food we have, coming up with new ways to reuse leftover bits and pieces. I guess, for them it was based out of financial necessity, but for us, it has definitely become a matter of personal choice to make sure we do our part, And our mothers' ways make sense. They are simple, doable and effective'* (Female, 33, banker)

Interviewees were encouraged to discuss specific traditional measures they use in their household to help reduce food waste. In addition to feeding leftover scraps of food to birds and pets, the most commonly recurring theme was *Composting*. Participants shared a variety of actions which they attributed to their elders that promote composting at home. These include utilizing fruit and vegetable peels and seeds, used tea leaves, eggshells, dried fruit shells, bread, and rice as compost. Some participants reported extending the concept by watering plants with leftover water after boiling rice and washing fruits. One participant even recorded pouring leftover or split milk and yogurt into the earth to encourage better plant health, as testament to the maxim *whatever comes from the earth, must go back to the earth*.

**Reducing use of chemicals**

Another recurring theme found after discussions with the participants was their conscious use of traditional remedies that reduce the use of chemicals in their households. Respondents expressed a generally consistent view that their elders lived life in a better, less polluted environment. One of the cited reasons for their belief that the previous generations enjoyed a healthier and cleaner environment was the absence of excessive use of chemicals in their everyday lives. Most of the participants (n=15) expressed their desire to be able to cut down on chemicals from daily use products. Contrary to the other types of behaviours recorded during this study, participants acknowledged consciously asking their elders for advice on how to incorporate natural alternatives to chemicals in their household activities. As one respondent stated,

*'Every time I encounter a problem, for which the solution entails using a lot of chemicals, I call my mom and ask her what she used to do. So, for instance, she told me to avoid using chemical-filled insect repellent sprays for lizards, and to just*



## **KASBIT Business Journal, 14(2), 14-36, June 2021**

*put crushed eggshells wherever I saw them, and they wouldn't enter that space again.*' (Female, 31, housewife)

*'Whenever I see ants inside the kitchen, I do what my nani (maternal grandmother) used to do. I would just sprinkle haldi (turmeric powder) wherever they are, and they would be gone. I do not want to be spraying chemicals anywhere in the house, especially in the kitchen. These totkay (traditional home remedies) keep the environment safe.'* (Female, 43, banker)

Environmental reasons cited by participants for reducing chemical use and opting for traditional methods included: not wanting to pollute the air by spraying chemical insecticides; not wanting to pollute water by dumping chemicals through water drains in the form of cleaning fluids; more natural and less chemical is considered good for self and family's health, especially that of the children; and traditional household remedies are perceived as having no side effects.

### **Reducing use of plastic**

Participants communicated the perception that the lifestyles of their previous generations did not rely substantially on the use of plastics. They also expressed their awareness of the problems currently being caused by an excessive use of plastic products and by-products in Karachi and opined that they did not want to exacerbate the situation. Hence, almost half of the individuals interviewed (n=10) acknowledged adhering to their ancestors' traditional methods for reducing plastic waste generated from their households, by using alternatively sourced bags used for groceries. In this regard, they cited using cloth and jute bags and palm-leaf baskets for regular grocery shopping, reducing the need for plastic bags on a daily basis. One challenge that was reportedly faced by the respondents was the lack of availability of these bags in Karachi. Participants reported getting them sourced from small villages in Sindh, where the culture of bag and basket weaving is still practiced by local artisans.

### **Water conservation**

Participants also professed adopting household measures to conserve water, by using tips shared with them by their elders. These included recycling water for various uses by predominantly using water from pots and buckets, rather than using running tap water. Some examples are recorded here.

*'My grandmother would always keep using the same bucket of water for different uses, till the water finally became unusable and had to be thrown away. Like, the water that is strained after boiling rice is used to starch clothes at home. Or fruits and vegetables are washed in buckets. When dirt settles at the bottom, the water collected at the top is used for watering the plants.'* (Female, 43, banker)

*'My grandfather's family belonged to Gharo (a small fishing village in the Sindh province in Pakistan). He would always dump the leftover water after washing fish and the heads, fins, etc. at the base of coconut trees. It was supposed to make them healthy. We do it for our coconut trees in Karachi now, and it works successfully to produce healthier coconuts.'* (Male, 42, professor)



Participants acknowledged that the reason for water conservation in their ancestors' time may have been resource scarcity, where running water was unavailable, and people had to travel considerable distances to carry water back in pots and buckets. This necessitated an overall culture of water conservation, whereby available water had to be put to optimum use, and this led them to adopt these measures. At the same time, they reasoned that the same holds true for today, when Pakistan generally, and Karachi specifically is facing an upcoming water shortage. Thus, the need for adopting the same measures becomes pertinent in the present day as well.

A comprehensive list of TEK-based environmental behaviours are categorized in Table 2.

### **TEK-based Behaviours for Personal Benefits**

This category configures traditional behaviours by their perceived personal benefits, as reported by the participants. During the interviewing process, the participants were encouraged to discuss various traditional customs, along with their reasons of adoption within their households. As the respondents regularly elaborated, each action categorized under this section was consciously adopted because of a particular personal benefit attached to it for the individual. These ranged from health gains, to beauty, hygiene, and medicinal benefits.

Behaviours pertaining to this category of TEK were reported by virtually every respondent in some form. Each participant reported adoption of a number of habits that use ancient wisdom for contemporary problem solving in their personal lives. The only variation noted was between male and female respondents. All female respondents endorsed a widespread self-use of various TEK-based practices within their households. On the other hand, male respondents stated observing the use of herbal or natural remedies by the women in their households. Their responses included statements like *my wife uses*, or *I have seen my mother use*, when asked about the use of natural, homemade medicines or personal care products in their households. Based on majority responses, several subcategories of use typologies emerged from careful data analysis. These include TEK-based a) medicinal remedies, b) beauty and hygiene remedies and c) home maintenance remedies.

#### **Medicinal remedies:**

Results suggested that a majority of respondents (n=17) acknowledged using traditional remedies for mild and commonly occurring ailments. The source of this therapeutic knowledge in most cases was the individual's female ancestors. Typical responses included:

*'My daadi (grandmother) always applies haldi (turmeric) on any wound, sugar if it's inside the mouth.'* (Female, 28, Lecturer)

*'My mom gives saunf and podina (fennel seeds and mint) boiled in water for stomach ailments.'* (Female, 37, university lecturer)

It is noteworthy here that 3 respondents were medical professionals, working in top medical facilities in Karachi, who also reported using traditional medication frequently. Owing to their profession, these three respondents were asked additional questions, relating to their preference of old wisdom over medical science while choosing a routine treatment course in their personal lives. Their responses demonstrated unique insights into TEK-based behaviour motivations, whereby they reported opting for traditional remedies as these were perceived to be healthier than the regular allopathic medicines. A few sample responses are recorded here.



**Table 2: TEK-based Pro-Environmental Behaviour Identification & Categorization**

Pro-environmental Categories	Behaviour	Reported Behaviours	TEK-based	Environmental
<b>Zero Food Waste/Compost</b>		Using water after draining rice to starch clothes Using water from straining tea leaves to give to plants Using leftover water after washing fish and the heads, fins, etc. to dump under coconut trees Using fruit peels, pits, and seeds in the garden as compost Fruit and vegetable peels are used to make snacks ( <i>e.g. potato peel fries; loki peel halwa; apple skin fritters</i> ) Using leftover water after boiling eggs to water rose plants Using eggshells with used tealeaves as fertilizer Using used tealeaves as a fertilizer Leftover roti, bread, rice is given to birds Leftover meat & bones are given to cats and dogs; crumbs go to the ants in the garden Split milk, leftover yogurt and fruit juice is diluted in water to water the plants		
<b>Chemical-free Products</b>	<b>Pesticides/Cleaning</b>	Using eggshells to ward off lizards Using a camel's thigh bone to ward off <i>deemak</i> (termites) Using bay leaves for getting rid of silverfish Sprinkling of turmeric to get rid of ants inside the house Scattering crushed <i>basi roti</i> (stale bread) to ward off ants Burning eucalyptus leaves to ward off mosquitos		




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	Putting fresh orange peels near windows; sticking cloves in fresh oranges to repel houseflies
	Using vinegar for polishing silver
	Using lemon juice to polish brass pots and pans
<b>Conserving Water</b>	Collecting water after washing meat, fruits, vegetables, rice, lentils etc. to water plants.
	Using buckets to take baths
<b>Reducing Plastic Use</b>	Using jute bags for grocery
	Using cane baskets for grocery
	Using cloth bags for grocery

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*'I know these over the counter (OTC) medicines contain lots of chemical compounds. If I can avoid ingesting them myself, or giving to my kids, I would definitely do so. And these (traditional) remedies have been used by my mother and grandmothers for ages now.'* (Female, 39, pathologist)

*'I have always seen my grandmother use these remedies on us when we were kids. And it worked for us. So now when my kids have a cold, or sore throat, or an upset tummy, my first go-to solution is the home remedies used by my mother.'* (Female, 34, radiologist)

It is pertinent to note that in the first example, the respondent cited the potential harmful effects of OTC drugs, and opted for natural medication, thereby doing a rational cost and benefit analysis based on *scientific knowledge*, while consciously choosing TEK-based remedies. In the second example, however, the respondent chose the traditional remedy because of its *perceived benefit* as passed down through their ancestors, and not because of any rational or scientific thought process behind adopting it.

### **Beauty & hygiene remedies**

While identifying TEK-based household practices, 15 female participants acknowledged using traditional remedies as beauty products, whereas 2 participants cited lack of time as the reason preventing them from using these home solutions. Most commonly used ingredients were recorded to be everyday food items (for example, milk, yogurt, fruit and vegetable pulp and juice, eggs, nuts and oils, herbs, and spices), whereas the methods of preparation varied from person to person. The perceived benefits cited by the respondents included acquiring better skin tone and texture, healthier hair, removal of acne and related problems, lightening skin tone, lessening/removing body hair, having whiter teeth, healthy nails, and weight loss.

The source of this set of TEK-based habits was recorded by the participants as their female ancestors. These included mothers, mothers in law, grandmothers, and maternal and paternal aunts, in most cases. One participant cited her great-grandmother, and another cited an old family maid who had been with the family for 25 years, as the ones transferring this knowledge. Six respondents who had pre-teen and teenage daughters reported passing on the traditional information to their next generation as well. When enquired about other media as the disseminating source of providing



traditional skincare remedies, the participants expressed a general mistrust of online and other media sources, and expressed confidence in traditions personally passed down in their families, as these methods were considered to have withstood the test of time.

### **Home maintenance remedies**

In addition to most participants reporting practices noted in the first two categories, a significant number (n=11) also acknowledged applying traditional wisdom to home maintenance measures. These included tips on general household cleaning; utensils, cutlery, and furniture polishing; bedding, furnishings, carpets care; preventing household insect-infestation; and garden maintenance. The primary source of information was regularly cited as respondents' female ancestors. Participants noted making use of commonly available natural household substances, including herbs, fruits, and spices for easy home maintenance tips. However, methods using lesser common materials as traditional remedies were also observed. Select examples of both types of remedies (common and less common) are cited herewith.

*'I have always found lemon juice to work brilliantly for polishing brass. It was my mother who told me this, and I have never used another polish.'* (Female, 39, housewife)

*'My mamoo (maternal uncle) owns a furniture shop and he always says to ward off termites in the house by using a camel's thigh bone. I don't know how that works, or where one gets that bone from. But we use it and it works for us too.'* (Female, 26, airline worker)

A list of TEK-based natural remedies used for medicinal, personal care and household uses as reported by the participants is presented in Table 3.

### **TEK-based Ritualistic Behaviours**

During the course of interviews, certain behaviours were reported that were self-described as ritualistic by the participants. Out of 21 respondents, 6 female interviewees revealed practicing behaviours which were not adopted because of any actual benefits but were adhered to because of family traditions. Most of these actions pertained to:

- rituals involving death (*reciting religious scripture for a certain number of days after death of an individual; making something sweet on a particular day of the month to benefit the departed souls*)
- rituals about birth of a child (*Tying a black thread around a new-born baby's wrist or placing a dot of kohl behind the ear to ward off evil eye*)
- everyday routine actions (*an upside-down shoe is a mark of disrespect to God; turning the corner of a prayer mat to ward off the devil*)

Participants acknowledged knowing these habits have no basis in fact but admitted to following them because the elders in the family expect them to. It is important to note here that this set of TEK-based behaviours falls outside the scope of the current study. The present study focuses on exploring TEK-based behaviours with real or perceived tangible benefits in urban settings in Pakistan, and ritualistic behaviours based on superstition, religion or spirituality fall outside the current scope of study.



### Discussion

Aggregate results from this study validate the call of action by Bleys et al. (2018), who proposed studying the ecological impact of individuals’ lifestyles on the environment, in addition to their personal actions. We do so by uncovering the presence of pro-environmental behaviours within traditional lifestyle habits of urban dwellers, thereby establishing the existence of a new pro-environmental behaviour typology. The findings from this study paint a picture of widespread presence and acceptance of TEK practices within non-indigenous modern households in metropolitan Pakistan. Urban respondents not only acknowledged using TEK practices in various household domains but were aware of how these ancient practices can provide solutions to modern day environmental problems, as elaborated in the previous section.

Thus, the most significant contribution of this work is the cataloguing of TEK-based behaviours practiced in urban Pakistan for the conservation of the environment. Extant literature has increasingly paid homage to the ecological contribution of traditional wisdom in indigenous societies all around the world for the last four decades. The current research took this understanding a significant step ahead by establishing a broad-based adoption of TEK-based behaviours undertaken consciously by modern, educated urban residents to preserve the environment. Traditional knowledge applied to the present-day pro-environmental behaviour categories of zero food waste, composting, reducing use of chemicals, reducing use of plastic, and water conservation provide strong evidence of a successful continuation of ancient cultural ways to address contemporary environmental issues. These findings from our research managed to contradict two widespread assertions in scientific literature; 1) that TEK is predominantly practiced in non-industrial, less progressive, often tribal societies (Berkes, 2017); and 2) that TEK is on a decline in urbanized societies around the world (Pilgrim et. al, 2008; Efimov et al., 2015). Indeed, to the contrary, results from the present study have expanded existing scholarship by the inclusion of *traditional individual household practices* to the list of ecological behaviours present in non-traditional urban communities. In doing so, this study attempts to answer the recent call for a shift in ecology scholarship that asks academic focus to move to adapting indigenous knowledge to urban city centres (Belldina, 2020). The focus of this stream of research up until now has included urban greening, ethnobiology and biocultural diversity (Buizer et al., 2016), among others. The current study output provides compelling evidence to include individual household behaviours to this body of knowledge.

It is pertinent to note here that respondents referred to specific environmental issues, like water shortage and acute plastic waste mismanagement, relevant to the city of Karachi while elaborating upon their TEK behaviours, and expressed a desire to contribute to stop further environmental degradation in the city. This particular outcome corroborates findings by Vorkinn and Riese (2001) who reify that place attachment fosters environmental concern among residents, and points towards the need to adopt place based communication strategies while developing environmental action policies.

**Table 3: TEK-based Remedies Reported for Personal Use & their Perceived Benefits**

TEK-based Behaviours	Perceived Benefits*
<i>Medicinal Remedies</i>	
Ginger & honey; pepper & honey	Sore throat treatment
Sugar; honey	Treat mouth ulcers






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Mustard oil	Earache
Boiled <i>Neem</i> tree (Margosa) leaves	As antiseptic
Clove and olive paste; salt & pepper paste	Toothache relief
Salt in warm water	Bleeding gums
Honey	On wounds for healing
Various teas using ginger; fennel seeds; mint; cardamom; cinnamon, turmeric	For gastrointestinal problems
Nigella seeds ( <i>kalonji</i> ); onion juice; boiled zucchini; raw garlic	Lowering blood pressure
Bitter gourd ( <i>karela</i> ) juice	Treating Diabetes
Crushed Fennel seeds ( <i>saunf</i> ), crystallized sugar ( <i>misri</i> ) & almond; carrot juice	For improving eyesight
Soaked almonds	For improving memory
Turmeric in warm milk	Relieves pain from injury
Bananas	Constipation relief
Chilled rosewater	For Conjunctivitis
Poppy seeds ( <i>khashkhas</i> ) in warm milk	For insomnia
Rubbing with raw potatoes	For mild burns
Applying raw onion juice	For treating beestings

***Beauty & Personal Care Remedies***

Milk; dairy cream; yogurt; lemon	Skin lightening and glow
Pulp of tomatoes; bananas; strawberries; peaches; apricots	Glowing skin
Paste of chickpea flour ( <i>besan</i> ), milk/yogurt & rose water	Glowing skin
Lemon juice	Acne; Dandruff
Rosewater & glycerine	Soft skin
Rubbing raw garlic	Strong nails
Various Oils (olive, coconut, almond, mustard, lime)	Hair growth
Yogurt & egg	Hair growth
Fullers earth ( <i>Multani mitti</i> ) paste with milk, water, or yogurt	Healthy & glowing skin
Aloe vera gel	For healthy skin and hair
Crushed mint leaves	For healthy skin
Beetroot juice	For treating bald patches

***Household Maintenance Remedies***

Lemon juice	To polish brass
Vinegar	To polish silver
Turpentine Oil; kerosene oil	To polish wood
Boiling citrus peels & cloves	As homemade air-fresheners
Lemon juice	To remove fabric stains
Putting <i>Neem</i> leaves and cloves while packing away clothes and bedding	To prevent mould and mildew

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Benefits of the remedies listed are perceived benefits as reported by the participants of this study. Existing academic support for TEK behaviour adoption from Pakistan lies predominantly in literature from the field of medicine, in the form of traditional medicinal remedies. Prior studies in



the medical field in Pakistan have yielded abundant evidence of traditional or folk remedies used for patients with a variety of ailments (Younis et al., 2018; Yaseen et al., 2019). However, this category of medical research focuses on the pharmacological aspect of the traditional treatments and does not address cultural or social characteristics of target populations. On the other hand, studies that have investigated culture-specific traditional medicinal remedies have restricted their attention to the rural and tribal communities (Ullah et al.2019; Abbas et al. 2017). Findings from our research support and expand these results by studying ethno-medicinal use in the largest metropolitan urban city of Pakistan, thereby establishing the presence of TEK-based medicinal use outside indigenous societies. Similarly, another main result of this study - adopting TEK behaviours for personal care benefits - was found to collaborate with existing literature as well, by endorsing Ramzan et al. (2017) and Anwar et al. (2015) who studied the use of traditional remedies for therapeutic and personal care uses in Pakistan.

An interesting outcome from this study revealed TEK-based behaviour adoption to be consistent across an ethnically varied respondent set. This was noted despite selecting a varied group of participants belonging to 5 distinct ethnic identities (Sindhi, Urdu-speaking, Punjabi, Memon and Pathan). In literature, customs and traditional cultures of ethnic groups residing within the same geographic location are reported to considerably differ from each other (Banban, 2018). Nonetheless, our research found respondents adhering to a variety of TEK behaviours regardless of their ethnic backgrounds. These similarities in behaviour across individuals from various backgrounds may be attributed to acculturation of different ethnicities into urban Karachi after two generations of continuous living in the city. This may have diluted the regional differences carried from their ethnic backgrounds, in keeping with the results of the study of Efimov et al. (2015). The authors acknowledge that this assertion cannot be generalized based on this research alone, and suggest further investigation to be undertaken into ethnic variations of TEK behaviours within urban Pakistan in consequent studies.

### **Conclusion & Future Implications**

This study set out to explore three dimensions of TEK-based behaviours in urban Pakistan. The study results provide validation to the first two, namely, (1) establishing the prevalence of TEK in urban households in Pakistan, and (2) obtaining insights and cataloguing TEK behaviours for urban Pakistanis. Endorsement for the third dimension was also found, which pertained to TEK-based behaviours corresponding to Western typologies. This was evidenced in the way participants self-catalogued TEK practices into categories like zero food waste, composting, water conservation, and reduced use of plastic and chemicals, which are catalogued typically as Western imaginaries.

The study yielded irrefutable evidence of the presence of TEK-based behaviours within modern urban Pakistani households, that potentially result in positive pro-environmental consequences. We contend that a holistic understanding of individual contributions towards mitigating environmental degradation cannot be achieved unless all individual behaviour typologies are catered to. An uncovering of a new classification of pro-environmental behaviours is instrumental towards the realization of this goal. We concede that the achievement of cataloguing an exhaustive list of such typologies is an arduous endeavour. Nonetheless, each new fragment of knowledge works towards completing the picture.



Towards this end, we suggest a two-fold course of future action. For academics, although we recognize that findings from this study provide a veritable source of a previously uncatalogued pro-environmental behaviour typology, we emphasize the need for further research into this phenomenon. We suggest expanding TEK-based behaviours for other urban respondent demographics. This may include diverse geographic or ethnic variants.

For policy makers, the study results recommend formulating future environmental policy that is inclusive of non-conventional contributors to environmental sustainability. Current emphasis remains on individual contribution to environmental sustainability by way of either modern pro-environmental methods, or ancient traditional measures, mutually exclusively. This paper delineates the need to consider these two domains synchronously in order to arrive at a well-integrated environmental policy. It is therefore deemed imperative for the government to embrace an inclusive approach in a bid to develop comprehensive environmental strategies that would benefit from the cumulative experiences of non-traditional environmental actors.

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