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Sustainability of Recycling Waste Picker Sustainopreneurs for Prevention and Mitigation of Municipal Solid Waste in Swat

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Abstract: This study assessed the role of waste picker sustainopreneurs (WPS) by examining their recycling contributions in a special case of District Swat, Pakistan. Using a transformative worldview, this study acknowledges their contributions to recycling. The study envisages how entrepreneurial agency works in unanticipated ways where the poorest of the poor enterprise without resources demonstrate unexpected agency to improve the environment. An inductive research design in conjunction with grounded theory was used to analyze data from 37 interviews in three tehsils of District Swat. The recycling sector uses primitive measures, which are completely informal, self-organized, and self-controlled. Surprisingly, we discovered that informal recycling contributes unfavorably to waste, energy, and food (WEF) security due to intermixing and adulteration, as well as acts as a gray channel for illicit practices that have taken advantage of tax amnesty in the area until 2023. The uncontrolled welding of half cut and nose cut car parts has skyrocketed the motorization index and CO₂ emissions; however, it has also resulted in alternative sources of livelihoods, as these accidental environmentalists had found modern sources of income. This is similar to low-tech innovation and business creation that takes advantage of tax holidays due to the special status of District Swat. The study highlights the most and least valuable recyclables and identifies the gray channel markets of spare parts, metal recycling, counterfeit products, fuel intermixing, and adulteration. The study contributes by untangling the understanding of a legal gambit of tax amnesty as a critical pre-policy input as well as advocates for rights of invisible stakeholders of waste management in Pakistan.

Keywords: accidental environmentalists; waste picker sustainopreneurs (WPS); janitorial stigma; unproductive recycling



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1. Introduction

The Global Climate Risk Index [1] places Pakistan among the top 10 countries that are the most vulnerable to the effects of climate change. The same report contends that in the past two decades, most developing nations have faced the brunt of climate change due to poor readiness. Moreover, the majority of sustainability-oriented products, processes, and measures continue to emerge primarily from developed countries [2], although countries such as the United States of America (USA) and China produce a combined total of >30% of total waste generated [3]. However, some of their efforts are in harmony with the United Nations (UN) Mandate of 17 Sustainable Development Goals (SDGs). The commitment of 193 members of the UN was attained for a group of 17 SDGs in 2015 to actualize “Agenda 2030” [4]. There has been a gradual realization for the preservation of the natural

environment, as indicated by the concept of the triple bottom line (TBL), which includes three pillars to achieve sustainable development: people, planet, and profit dimensions [5]. Many countries, including Sweden, have demonstrated impressive recycling rates of 99% due to what they call producers' responsibility, followed by Germany (87%) and Singapore (60%) [6]. The higher recycling rates in Sweden are attributed to producers' responsibility coupled with high public awareness and end-user recycling rewards [7]. Waste buyback programs are promoted in advanced countries to complement the municipalities in the implementation of waste-to-energy solutions, among other measures [3]. Hence, there is a greater need to focus on recycling and waste mitigation measures and strategies in less developed countries (such as Pakistan) because of their low level of sustainability practices. Moreover, the absence of such measures cascades negative externalities due to the transboundary movement of waste, which hinders the attainment of Agenda 2030. Hence, the importance of waste picker sustainopreneurs (WPSs), which lie at the convergence of environmental, social, and traditional forms of entrepreneurship in line with TBL practices, has gained much traction with respect to recycling of municipal solid waste management (MSWM) systems in the least developed nations [8].

The global volume of waste per day has been estimated to reach 6 million tons in 2025 and continue to increase to reach 11 million tons before the 22nd century [9]. In line with "Agenda 2030", waste diversion and recycling have become wicked problems faced by humanity [10]. Such challenges interface with SDGs on population, urbanization, consumption, and production, which cause landfill accumulation with no guiding policies for waste diversion and recycling [11]. The waste collection and recycling in the target area of the study was low. The non-taxable status of District Swat does not allow it to attract funding that is commensurate to its tourist carrying capacity; 40-50 thousand tourists visited Swat on Eid days alone in 2019 [12]. Using an external organization view [13], we examined the impact of external factors such as season, type of recyclables, government policies, migration, floods, and manmade disasters on WPSs in District Swat.

The aim of this study was to examine the contributions of informal WPSs by acknowledging their recycling services in District Swat as waste prevention and mitigation measures. From a lifecycle assessment (LCA) viewpoint of various types of recyclables, the study examined central stakeholders in municipal solid waste management (MSWM) value chains in Swat, i.e., waste picker sustainopreneurs (WPSs). WPSs, as asserted [8], are accidental environmentalists, although a lifecycle assessment includes other stakeholders such as junkshop scrap dealers and recycling plants that work in tandem to form the invisible stakeholders of MSWM system in vogue. Pakistan is also a large market for reusing discarded second-hand clothes, shoes, bags, and second-hand WEE items such as computers, laptops, cars, and other smart devices such as cell phones, by enhancing the lifecycle of products as well as acting as a dumping ground for developed countries [14]. There is a scarcity of studies on the informal role of WPS, most likely due to the challenging and complex nature of data collection, as WPSs attempt to preserve their social status by working inconspicuously [15]. The WPSs contributions are much needed in the least developed nations, where there are inadequate technological measures available to offer complete waste management and recycling solutions [16]. These informal stakeholders use low-technology, i.e., Kriznerian business models with creative (yet primitive) measures that are self-organized and self-controlled; although in doing so, they are prone to a variety of diseases and hazards. Using innovation theory of a new combination of economic resources as a theoretical lens, the incremental innovation is called Kriznerian or low-tech forms of innovation in comparison to radical innovations that involve significant changes, also called "disruptive" or "high-tech" innovation [17].

Pakistan is the fifth most populous country in the world, with a population of 223 million (i.e., 2.83% of the global population) [18]. Drawing on the Malthusian view of economics, the exponential growth of population underlies most of the environmental problems that can be restored through well-planned man-made measures or, alternately, left to checks of nature [19]. Moreover, consumption and production patterns as well as recycling

measures vary across nations if we compare the least preferred South Asian environments to the most preferred environments of the Western world. Advanced countries have an inclination towards sophisticated ways of reducing, reusing, and recycling. The waste hierarchy, as part of the waste directive (2008/98/EG), was formed and adopted by the EU nations [20]. In the waste hierarchy, the focus is on minimizing the adverse effects of waste on human health and the environment, and it is an important step towards understanding context-specific measures and practices. There are five steps in the waste hierarchy in the context of waste mitigation and prevention; however, there is a very low level of recycling in the target area, occurring at the base of the pyramid. The majority of recycling work is performed by WPSs, and is characterized by traits such as low technology, lack of work permits, small-scale work, unregistered operations, and being labor-intensive and self-administered work; thus, it has been termed “accidental sustainopreneurship” [8].

In developing countries, government interventions strive for the integration of shadow economy stakeholders in recycling and waste value chains [21]. The annual Pakistan economic survey for 2019-2020 reports that 72% of Pakistan’s economy is informal, with 37.9 million non-agriculture workers out of 61.7 million in the workforce [22]. The informal WPS’ livelihoods are prone to environmental factors such as COVID-19 and the associated economic downturns. The transition of the informal value chain actors of waste recycling is possible through tight monitoring and with measures for their gradual inclusion into the documented economy. The scholarly literature contends that a combination of illegal (yet legitimate) means and ends of factors of production results in the creation of an informal economy [23], as shown in Figure 1. This shows that such informal sustainopreneurs, which operate from below the base of pyramid, can be categorized into three groups (A, B, and C in Figure 1). These various groups of sustainopreneurs fall into the informal economy as they participate in legitimate work, i.e., work that aligns with societal norms, values, and beliefs where cleanliness is emphasized to the extent that it is considered half the religion among Muslims. On the other hand, due to the lack of registration and work permits, these small-scale businesses can also be termed illegal as per the law of the land [24]. These types of tiny businesses can be transitioned into formal businesses (as indicated by the arrows in Figure 1), or, alternately, may be left unattended to move towards what is termed a renegade economy [6]. The former case of transition to a formally documented economy was the main objective of this study in the target area of study for which we use recycling as a stepping-stone to acknowledge their pro-environmental services although undertaken in unexpected ways.

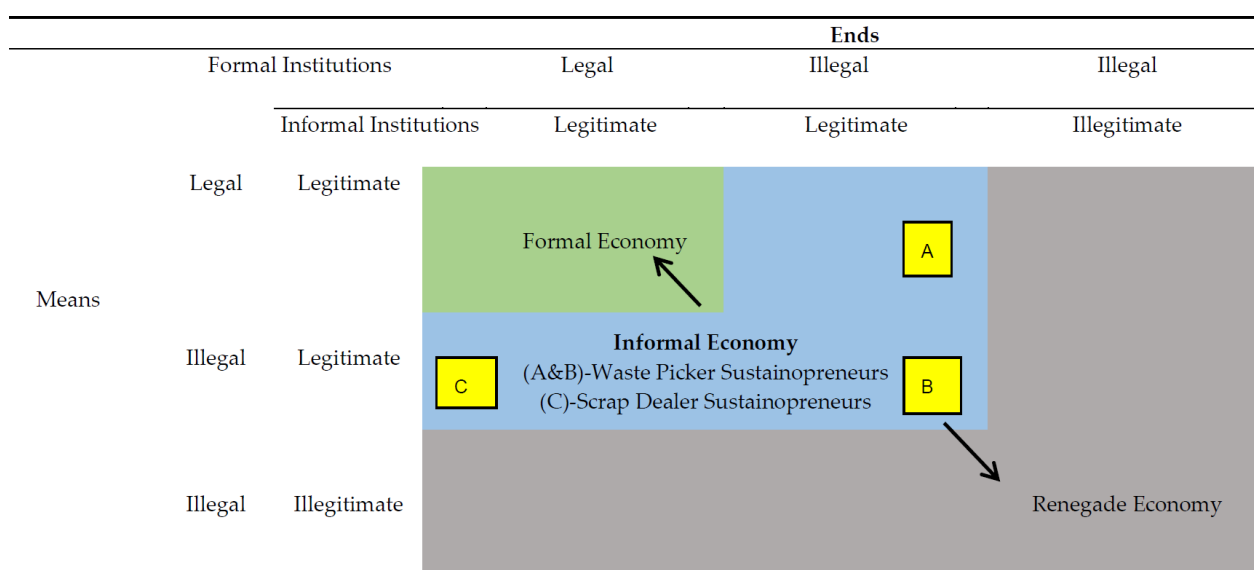


Figure 1. The means and ends framework of informal economy. Source: [23] (adapted from Web et al., 2009).

2. Materials and Methods

2.1. Data

The data were obtained from the Municipal Solid Waste Categorization Study undertaken as part of Chinese government-funded PhD studies. The study used a transformative lens to highlight reality grounded in interactions with people whose work is income worthy but stigmatized in the eyes of general society. From a LCA perspective, their work is part of recycling value chains and hence, they are termed WPSs [8]. Grounded theory (GT) methodology is used to analyze the collected data through 37 semi-structured, in-depth interviews (IDIs) of WPSs. Their working of sustainopreneurs complements governments to overcome the grand challenges of wicked nature [25]. The issue of recycling and the transition to formal integration systems presents an indeterminate situation due to the complex and uncertain nature of studies with repercussions on sustainability practices beyond borders [26]. For the purpose of this study, three tehsils of District Swat, namely Barikot, Charbagh, and Mingora were used, as shown in Figure 2.

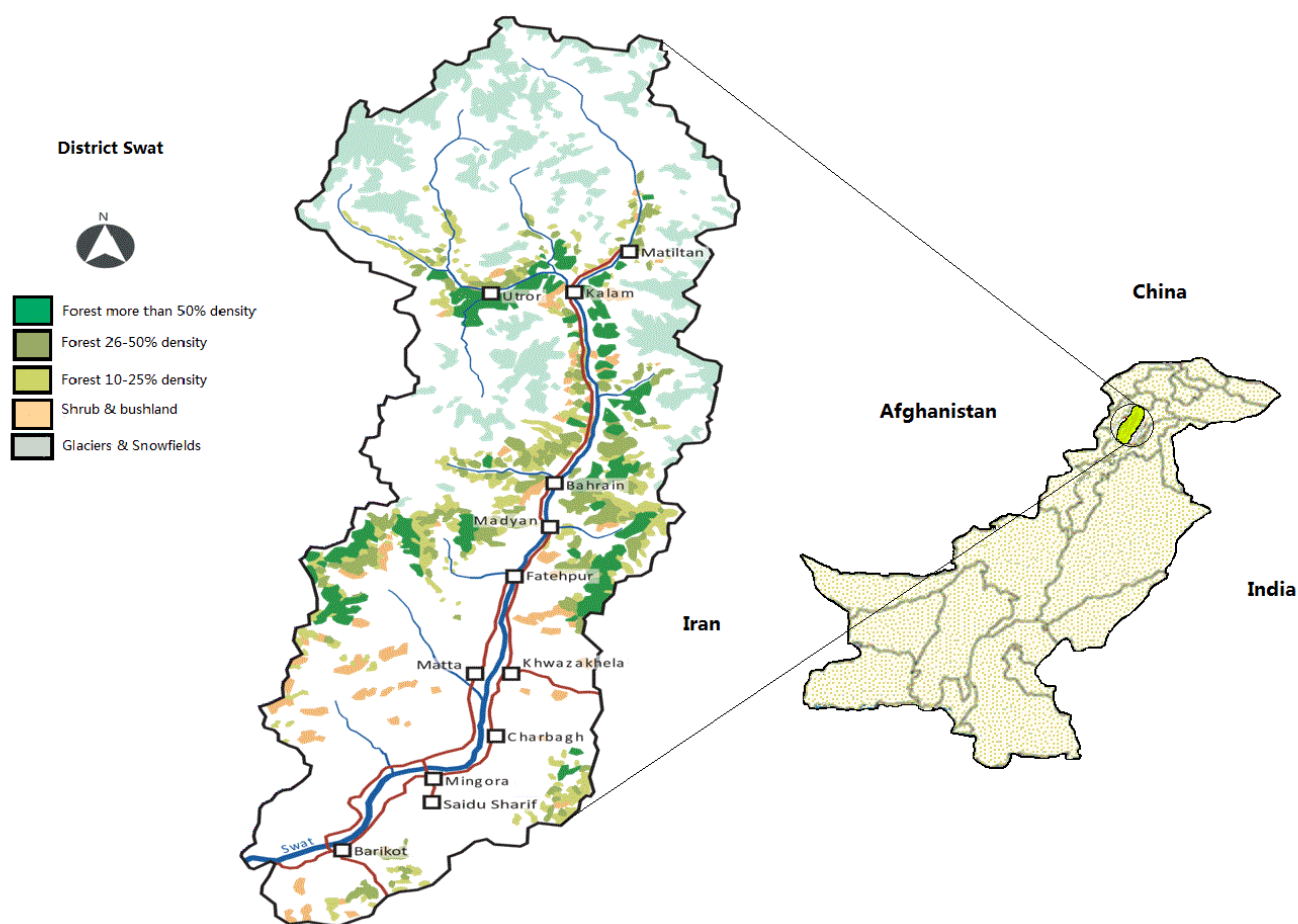


Figure 2. Location of District Swat, northwestern province, Pakistan. Source: [27] (<https://www.refworld.org/docid/460a3b2f2.html>, accessed on 7 March 2021).

2.2. Territorial Jurisdiction of the Study

Pakistan has four provinces, each of which is further subdivided into larger units of divisions and districts. The districts are further divided into tehsils and Union Councils. There are 30 divisions and 132 districts in Pakistan. Of these, seven divisions and 34 districts are located in the northwestern Khyber Pakhtunkhwa (KPK) province. The target area of the study was District Swat, which is part of the Malakand Division in KPK province. Swat is part of the Provincially Administered Tribal Areas (PATA) in KPK, with a total area of 5337 km² and a population of 2,309,570. The 12 districts of PATA and 10 agencies of

Federally Administered Tribal Areas (FATA) in KPK enjoy special concessions in income tax, sales tax, excise, and customs [28]. The tax holiday maturation will occur in June 2023, signaling a critical pre-policy formulation juncture calling for input in the form of measures, policy, and practice for attainment of sustainable development.

2.3. Sampling Procedure

Trust with participants was developed through ongoing interactions over 2 years with informal solid waste management and recycling stakeholders. Data were collected through 37 in-depth interviews (IDIs) in Barikot, Charbagh, and Mingora Tehsil, as shown in Table 1. In qualitative studies, there are no readymade formulas for the calculation of sample size, as the emergence of theoretical saturation through repetitive response emergence signals data adequacy. Hence, sample size depends on the quality of the interviews, irrespective of the number of participants. The size of 37 interviews within a category was recommended in light of the best practices of 20 interviews recommended by Creswell and 25 by Charmaz [29–31]. Moreover, [32] favors a general rule of 12 ± 10 interviews in qualitative research designs. However, we took into consideration the saturation as determinant of sample adequacy in addition to preceding recommendations in regards to number of interviews. As part of a strict criterion for interviewee recruitment, it was mandatory to interview both male and female participants. Participants were given pseudonyms in lieu of real names to maintain privacy, which is desirable in a local context where janitorial work is considered a taboo and people are shy and status-conscious. WPSs were also given token money such as gifts and food parcels in exchange for their participation. The interview guide was recursively modified during the pilot phase of unstructured interviews and translated into the local dialect for the ease of participants. Informed consent was sought from participants to ensure ethical sensitivity regarding the purpose of the research, as naiveté regarding ethics in research is in itself unethical [33].

Table 1. Demographic profile characteristics of the sample.

Characteristics	No. of Respondents	Percentage
Gender		
Female	15	40.54%
Male	22	59.46%
Location (tehsil) in Swat		
Charbagh	12	32.43%
Barikot	12	32.43%
Mingora	13	35.14%
Level of Education		
Illiterate (No school)	27	72.97%
Middle (8th grade)	7	18.92%
Matric (10th grade)	3	8.11%

Table 1 shows the proportion of male to female respondents as well as the distribution of interviews conducted across the three tehsils of Charbagh, Barikot, and Mingora in Swat. Moreover, the level of education for all the 37 respondents has been furnished, which shows a low level of schooling among the participants in the study.

2.4. Process of GT-Based Analysis

The GT procedure uses concurrent data collection and analysis because of the reciprocal relationship between data and emerging substantive theory [29]. This process is carried out in conjunction with open, axial, and selective coding stages, as shown in Figure 3, where input from open coding is incorporated into axial and then selective coding recursively until the point of theoretical saturation [34]. This approach was completed, with the use of discriminate sampling, where new participants were recruited based on inputs from prior interviews and the literature review was updated accordingly. Thus, in the open coding analysis, the sampling was purposive; in axial coding, systematic and

deliberate sampling was used in selective coding to integrate various categories through the condensation process [35]. In GT-inspired methods, this allows arrival at a substantive level theory that depicts the characteristics of a social process of interest, i.e., sustainability of waste recycling sustainopreneurs through context-specific measures and strategies for sustainable development.

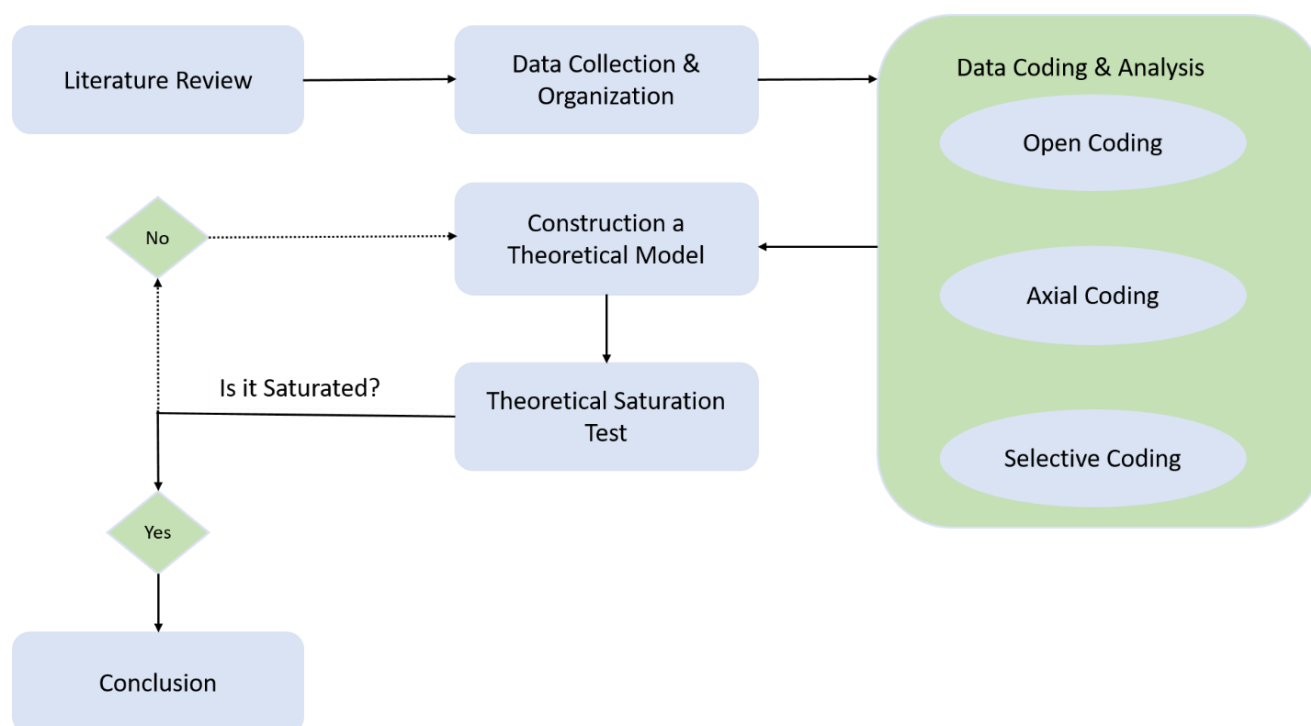


Figure 3. Process of three-staged grounded theory (GT) analysis. Source: [34] (adopted from Li et al., 2019).

3. Results

The point of theoretical saturation began unfolding with the 35th interview, after which new insights ceased to emerge with regard to the effects of external factors (including seasons, government policies, health issues, migration, and man-made disasters) on the livelihoods of WPSs. The data transcripts were voluminous and winnowing of text, which is an established method in qualitative studies, was performed line-by-line to identify emergent categories. A fine-grained analysis was carried out manually, without the data management NVIVO software that further necessitated the process of winnowing of data into manageable categories. In the same way, the ensuing analysis is related to the impact of seasons on the working of WPSs in District Swat.

The open coding analysis indicated that there is a great influx of tourists to Swat Valley during summer, which results in an increase in food waste from hotels and riverside parks; a general rise in littering is witnessed, as well. In the Swat hospitality industry, there are approximately 350 hotels, an equal number of restaurants, and dozens of marriage halls, which are food waste hotspots. The axial coding indicates huge food waste during the sacrifice of almost 10 million animals (mostly cows, sheep, goats, and camels) across Pakistan. Nowadays, both Eid festivals—Eid ul Fitr and Eid Al Azha—are celebrated during summer seasons; hence, a greater rise in waste is observed during the summer season in the target area. Similarly, there is a higher demand for cattle raised by WPSs from the Matta, Kohistan, and Kalam areas during the Eid Al Azha season by selling sheep in roadside temporary cattle markets. The axial coding indicates that during Eid Al Azha, post-sacrifice waste is disposed of by many WPSs; in return, they are able to collect animal hides with low monetary value. The number of tourists during national holidays and long weekends is in the tens of thousands, and are known to visit parks in

Swat Valley, Kalam, and Malam Jabba Ski Resort tourist hotspots [36]. Selective coding shows that despite the working of government machinery, there is inadequate provision for MSWM and recycling. However, during the COVID-19 pandemic, a ban on tourists' entry adversely impacted the work of not only WPSs but also other waste value chain stakeholders. In light of the preceding analysis, this study posits that greater emphasis on recycling campaigns is required during summer seasons, especially measures for safe disposal of waste generated from temporary roadside cattle markets and post-slaughter stomach waste of animals following the Eid Al Azha festival.

Regarding alternative livelihoods of WPSs, another question was posed. The open coding evidence suggests that young waste pickers have a choice to work in >1000 car wash service centers, which are mostly associated with >500 non-custom paid (NCP) car showrooms and dealers of unregistered cars. This is evident from the uninterrupted arrival of NCP cars into the area which were originally destined for landlocked Afghanistan. The axial coding data suggest that tourism has been flourishing in District Swat recently; according to modest estimates, tens of thousands of tourists visit Swat district during three days of Eid. In terms of the hospitality industry, there are an estimated 350 hotels and a number of banquet halls, parks, and restaurants. However, the Eid Festival is a highly significant occasion for Swat and necessitates proactive measures and strategies. The selective coding analysis based on inputs from preceding coding stages suggests that there are >200 petrol stations and 1000 car wash centers on the sideways of River Swat that are involved in the business of car washing, which overuses drinkable water. The marble slurry generated from marble plants in the area is a useful raw material; however, at the same time, marble contributes unfavorably as it mars the beautification of the area as well as causes pollution. The preceding analysis based on input from prior coding stages indicates the prevalence of the water-energy-food nexus, as introduced by the World Economic Forum conference [37]. The water-energy-food nexus impacts people's livelihoods at the community level [38], especially when the water, energy, and food loss is enormous, as in the case of District Swat.

Regarding productive recycling practices, the open coding shows that many of the items have more than one use in terms of waste reduction, re-use, and recycling, as shown in Table 2.

Table 2. Recyclables and their alternative uses, with estimates.

Recyclable Items	Secondary Uses	Tertiary Uses	Estimated Annual Volume
PET bottles	Kerosene, petrol, and diesel resale	Polyester clothes Bags Ropes	20 million bottles
Old tires	Shoe soles Manufacturing	Brick kiln fuel, charcoal supplement for roads	400,000 units
Post slaughter waste of cows, buffalos, sheep, and chicken	Organic fertilizer Pet food Dung cakes Leather hides	Banaspathi Ghee Edible oil Vaseline -	200,000-400,000 units
Cut and shut car parts	Local assembly, welding together	Repair market Spare parts, body or chassis change	100,000–1 million units

As shown in Table 2, plastic bottles were used for resale of small quantities of petrol and kerosene and in the production of polyester for clothes, bags, and ropes. Axial coding unveils that newspapers of foreign languages (though very toxic due to chemical ink) are used in packaging and parcel services; local newspapers are seldom utilized because they contain holy verses and sacred names of the Muslim faith. Selective coding suggests that collected bones were used for manufacturing cutlery plates of high quality. Moreover, electronic scrap equipment is broken down to collect valuable copper ore as well as silver,

gold, and iron through creative resource recovery mechanisms of recycling. Various metals (such as iron, silver, steel, and copper) are transported to the nearest factories for recycling. In general, during waste transportation from residences or junk shops to recycling plants, waste passes through many hands, resulting in high transportation costs and greater margins for junkshop dealers and recycling plants. Food waste (such as organic kitchen waste from households, hotels, marriage halls, and restaurants) is used as cattle fodder due to the shrinkage of farmland in the mountainous Swat Valley, which is an alternative income source for WPSs who also trade cattle. Finally, poultry-oriented chicken waste is sold at a price of approximately 9000 rupees per mound, and is processed into Vaseline and other products such as edible oils.

The unproductive recycling practices identified during open coding indicate the use of discarded tires as a charcoal supplement as well as for manufacturing traditional Kaptan shoe soles. The remaining leftovers alongside tetra packages are sent for burning in brick kilns in downstream areas. Axial coding leads to the formation of categories that indicate a common social habit of burning household waste at night. Other valuable items include long human hairs, which are used in wig making for mannequins, hair medicine, and color testing. Selective coding suggests that the least attractive recycling item is the leather of sacrificial animals amidst the fact that approximately 200,000 animals are slaughtered during the 3 days of the Eid Al Azha festival in District Swat. Due to the hilly areas, the land has shrunk across River Swat and no suitable place is available to bury the perishable hides nor there is any processing factory for value addition to raw material of sacrificial leather. Finally, some items such as cast brass plated in chrome are extracted from sanitary water tapes, which are often stolen; hence, the use of plastic water tapes is promoted. Since the transportation of recyclables involves the transportation of huge amounts of compressed items by trucks and lorries, this practice has an adverse impact on roads, especially bridges constructed over River Swat.

Regarding the government role, open coding suggests that due to the tax-exempted nature of the target area, there is a loose provision of sanitary services. The Water and Sanitation Service Company (WSSC) and Swat District Development Authority (SDDA) in tandem with the Tehsil Municipal Administration (TMA) are functioning in their own capacity. The informal and unregulated waste value chain stakeholders of scrap dealers, termed “Kebaryan”, seems to facilitate an illicit market for the trade of smuggled items such as cars, bikes, and other electronic appliances, as well as items associated with drug-related crimes. Recyclable items are deconstructed and sold in secondhand markets. The axial coding suggests the existence of ready availability of nose cut and half-cut car parts that are welded together, posing serious issues to human safety. The working of “Kebaryan” scrap dealers also supports the production of counterfeit products by way of collection of engine oil gallons (Jerry cans), shampoo bottles, water taps, and sanitary ware. Moreover, second-hand articles ranged from reconditioned cars, computers, laptops, cell phones, and low-value items such as shoes and clothes imported from advanced countries. These products are readily consumed by the general public due to their low prices and usability, and are superior to locally manufactured items. Selective coding indicates that due to a higher than normal motorization level, a car wash industry exists as an alternative livelihood source for young waste pickers who participate in car washing due to financial incentives. More than 5000 car wash service facilities are estimated to operate in the Malakand Division, which consists of seven districts, including District Swat. However, excessive wastage of drinkable water during car washing does not augur well in terms of water scarcity faced by those living downstream in other parts of the country.

Regarding the general treatment of the public, the open coding analysis classifies WPSs into upstream shepherders from “Matta”, “Kohistan”, and “Kalam” and autonomous waste pickers referred to as “Changaryan” from downstream areas. Other than this, “Ajar-Gujjar” tribes deal in milk and still other tribes exist, who primarily belong to Afghanistan and tribal areas of the “Bajuar” and “Momand” districts. The shepherders are always observed in transit, with no permanent residence for themselves or their cattle. On the

other hand, the “Changaryan” tribe and “Kadwalans” came from other parts of the country. Axial coding shows that the majority of local people in peri-urban areas are uninterested in payment generated from waste. In lieu of this, they expect waste collection from their doorsteps. In the majority of instances, the informal collectors and scavengers are provided with financial assistance from residents as part of charity of the annual 2.5% “zakat” distributed especially during the month of Ramadan [39]. Approximately 8–10 million animals are sacrificed in Pakistan, which serves as a major source of leather collection for charity purposes. In recent years, the price of skin hides in international markets has been very low because many tanneries are receiving hides free of cost, making their recycling difficult in the land-strapped District Swat. Selective coding suggests that such people behave inconspicuously due to stigmas associated with waste work. Therefore, waste pickers are mostly from minorities such as Christians, Afghan refugees, and internal migrants from other parts of the country. These people have dual and stigmatized identities and prefer to work in distant areas in order to preserve their social status in ancestral areas where there are relatively few earning opportunities [8].

Another question pertains to the health status of WPSs, especially in the context of disease outbreaks. The contention here is that many other outbreaks, such as Chickengunya, Lashminia, and Polio, have found a permanent place in Pakistan. Afghanistan and Pakistan are among the laggards in the eradication of the poliovirus [40] for a variety of reasons, and there is hope that the COVID-19 vaccination curve will be shorter than that for the Polio vaccination. The open coding suggests the prevalence of some skin diseases and allergies in WPSs despite the use of no gloves and masks except in lockdown situations. Other studies conducted in District Peshawar also report grandiose claims of WPSs to boast higher immunity levels [8]. However, there is evidence to suggest the contrary in other developing countries such as Kenya, where life expectancy declined from the health situation in the 1980s due to the lack of government support and poor sanitary conditions [41]. The selective coding suggests that the prevalence of disease is small because the majority of sustainopreneurs are young, although the life expectancy in Pakistan is 65.4 years. The current trend of 10–15% of recycling is carried out by informal WPSs in tandem with other waste value chain stakeholders has to attract the attention of policy makers. This is where the role of WPS is important, especially in underdeveloped contexts.

Another sub question pertains to external manmade and divine disasters on the work of sustainopreneurs. The open coding suggests that the Swat area has suffered in the past due to the earthquake in 2005, militancy in 2007, and massive floods in 2010. The axial coding suggests that people working below the base of the pyramid suffered migration trauma inflicted by insurgency in Swat, followed by internal migration caused by military operations. The axial coding suggests that the sand and stones brought down with floods led to the establishment of crush plants that support the construction industry, although it has adversely changed the beauty of the landscape alongside River Swat. The selective coding analysis based on inputs from preceding coding suggests that WPSs with minimal livelihood assets are living in perpetual poverty and are prone to a variety of external threats and diseases such as COVID-19, which pose severe threats to their existence and to the transition to a formal circular economy. The government has announced a stimulus package of 1.24 trillion Pakistani rupees alongside other relief measures that are likely to assist indigenous national identity cardholder nationals [22].

4. Discussion

The importance of sustainopreneurs can be best examined against the backdrop of poor environmental performance on various dimensions of sustainability. Sustainopreneurship, as a form of entrepreneurship, is widely applied to trigger positive multiplier effects because it spurs job creation, enhances food security, extends the life span of dumps, and, thus, helps mitigate the negative effects of climate change [42]. The need for greener organizations has resulted in the emergence of sub fields of entrepreneurship at the confluence of business and environment. The boundary spanning nature of entrepreneurship as a

field of study and its relationship with the environment allows room for recent trends such as sustainopreneurship. Sustainopreneurship causes positive effects on recycling sectors by reducing money spent on public health, improves food security as well as act as mechanism for earning a livelihood while extending lifespan of dumps [8]. Other examples of such sustainopreneurs who delve into pro-environmental endeavors include waste pickers sustainopreneurs, shepherders, janitorial workers, minorities, house servants, and maids. Other names similar to sustainopreneurs are ecopreneurs, bioneers, and green entrepreneurs [43]. The movement of herd-owning sustainopreneurs up and down Swat Valley signals weather or seasonal change trigger points. A similar pattern was previously reported [44], whereby indigenous knowledge regarding the behavior of animals, insects, and plants was used to predict rain and other weather conditions. They enjoy greater survival and sensing skills, as these WPSs are vulnerable to a variety of factors beyond their control.

Regarding waste recycling in District Swat, most of the waste collection is carried out in summer due to the short-term influx of local tourists. Nowadays, the events of two Eid festivals and Ramadan coincide with summer seasons, which have further resulted in increased waste in the area. On one hand, recycling can be unproductive, such as when it is used for unlawful practices such as intermixing, adulteration, and welding cut cars from spare parts by taking advantage of the special status of the tax-free zone. On the other hand, it is a useful source of livelihood for people who participate in waste collection as well as mobile fruit and vegetable vending with these welded vehicles. However, excessive motorization in Swat unfavorably affects the natural balance of water, energy, and food-related waste (WEF) [45]. WPSs in this part of the world are from downstream areas of Punjab nomadic tribes “Changaryan”, upstream northern areas of Pakistan, and include those residing in former refugee camps in KPK; Pakistan still hosts 1.5 million refugees. For the majority of the time, these people have dual identities, especially those from upstream areas who are mostly shepherds. Pakistan is a status-conscious society, and as such, the grandiosity and discourse of bigotry is conspicuous in WPSs who live across the District Swat. Such people exercise self-denial, although they contribute to positive multiplier effects on the environment; however, in the process they also seek personal benefit. Using the social construction of janitorial stigma, their work is held in disdain and their identities are tarnished, although they are not unhygienic themselves [46]. The study envisages how entrepreneurial agency works in unanticipated ways where the poorest of the poor enterprise without resources or assets, yet they demonstrate unexpected agency to improve the environment. Hence, these sustainopreneurs can also be called accidental environmentalists or sustainopreneurs who work below the base of the pyramid [15]. Sustainopreneurship as a form of entrepreneurship involves the creation or extraction of value from an environment. Most of the sustainopreneurs of Afghan origin lack work documents despite the fact that they had lived in Pakistan for more than 20 years. Pakistan remained the world’s top refugee country for the past 22 out of 41 years, since the inception of the Afghan War, and is inhabited by 1.5 million of them. Approximately 66% of these people live near urban areas to earn livelihoods [47]. However, the enforcement of the Pakistan Citizenship Act (1951) in true spirit allows room for their transition to citizenship through naturalization, marriage, and birthplace [48].

Pakistan is an agriculture-based economy with a huge domesticated livestock base, as evident from its world ranking as second, third, and ninth in the number of buffalos, goats, and cattle, and fourth in milk production [49]. It has been estimated that on average a sheep or goat produces 1360 kg of manure per year. Hence, there is a huge volume of waste deposited on the roads as shepherders move up and down the Swat Valley. The importance of the Eid Al Azha sacrifice involving 8–10 million animals across Pakistan does not include the waste created by unsold livestock brought to roadside markets. Their waste can be either a source of manure or pollution left on nearby roads that can severely harm public health. Moreover, future studies are encouraged to include junkshop dealers,

termed “Kebaryan”, and recycling plants as stakeholders in the recycling value chain in various districts of Pakistan in order to offer a more holistic understanding of WPSs.

5. Conclusions

A highly creative process of waste recycling is occurring across District Swat, where value exploration and extraction occurs through low-technology (yet innovative) measures. The study envisages how entrepreneurial agency works in unanticipated ways, where the poorest of the poor enterprise without resources or assets, yet they demonstrate unexpected agency to improve the environment and hence are called WPSs. The collection and recycling of 10–15% MSW are performed partly by WPSs and junkshop dealers, “Kebaryan”, although recycling plants and other value chain stakeholders also exist. These people operate in various forms such as Afghan refugees, minorities, the local “Gujar” (milkman), “Ajar” (living in mountains), the “Kadwalan” tribe who move up and down River Swat, the “Changaryan” who inhabit downstream areas of Punjab, and internal migrants from “Bajuar” and “Momand” areas. The evidence shows that recycling can be unproductive or parasitical, especially when recycled inputs are used in intermixing fuel, preparation of counterfeit products, and reverse assembly of discarded material to take advantage of the tax amnesty, all of which pose serious threats to human safety. Moreover, due to the availability of cut and shut cars and loaders, most of the sustainopreneurs have scaled up waste picking into rickshaws and cut loaders, leaving waste picking a less attractive source of livelihood. This makes the current study even more relevant as it advocates the provision of better facilities to raise the self-esteem of these invisible pro-environmental stakeholders. The process of value extraction through recycling occurs through the transportation of valuable items in large quantities from scrap dealers to recycling plants, which also serves as a potential avenue for the movement of illicit goods and plays a role in the manufacture of counterfeit products by way of unproductive recycling, such as the production of replicas and generic products. As a result, a secondhand market is present across Swat and throughout Pakistan and is supported by informal waste assemblers and recyclers whose source is neighboring landlocked Afghanistan. The issue of higher motorization index in the Swat valley must be monitored through schemes allowing no further entry of NCP cars. Moreover, measures for the safe disposal of waste from pollution hotspots such as temporary cattle markets and parks in Swat must be ensured through proactive measures.

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