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Original Research Article

Flushed, burned, or forgotten? The climate cost of menstrual waste in rural Punjab

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ABSTRACT

Background: Menstrual waste management has long remained a neglected concern despite increasing policy attention to menstrual hygiene and awareness. Persistent socio-cultural taboos and limited coordination among key stakeholders, including the Central Pollution Control Board, solid waste management (SWM) authorities, and other implementing bodies, have weakened the planning and execution of effective disposal systems. This misalignment not only affects the health, dignity, and mobility of women and adolescent girls, but also restricts their access to education and public spaces, reinforces gender-based inequalities, and contributes to environmental degradation, positioning menstrual waste as a critical yet overlooked component of sustainable development.
Methods: The present study draws on empirical data collected from adolescent girls in rural villages of Fazilka district, Punjab. Individual interviews were conducted, and government schools were visited to observe and document the availability and condition of menstrual hygiene facilities, including waste disposal strategies, to assess infrastructural support.
Results: The findings reveal that although a majority of adolescent girls now use disposable sanitary pads, safe and sustainable disposal remains a major challenge. Despite the rapid expansion of the sanitary product market in India, disposal systems continue to be severely neglected. Socio-cultural norms, product availability, personal preferences, and levels of awareness significantly shape menstrual product choices and disposal practices.
Conclusions: The study further establishes a clear linkage between menstrual waste management and multiple sustainable development goals (SDGs), emphasizing the urgent need for comprehensive menstrual education for all genders, contextual revision of existing schemes, and stronger monitoring and implementation mechanisms to integrate menstrual waste management into broader frameworks of environmental sustainability and gender equity.

Keywords: Menstrual waste management, Stigma, Sustainable development goals, Environment impact and risk, Sustainable solutions

INTRODUCTION

Menstruation is a natural and vital biological process that marks the transition from childhood to womanhood. This significant life phase is often accompanied by rituals, teachings, and restrictions that aim to shape girls into their new social roles. However, in the Indian socio-cultural context, menstruation remains a topic shrouded in silence, stigma, and misinformation. Many girls reach menarche with mixed feelings of anxiety, horrify, and eagerness to know about the phenomenon, where the majority of adolescent girls reported a negative attitude about their first menstrual experience.[1-3] In the absence of open dialogue or proper education, some even believe during its commencement that they are suffering from a serious illness or that death is imminent. Gradually, they come to understand their experience by observing that their mothers and sisters have gone through the same, yet

this realization introduces them to another burden; the cultural expectation to remain silent about their pain, discomfort, and emotional distress. This 'culture of silence' manifests in several ways: hiding sanitary products, secretly managing menstrual hygiene, suppressing discussions around menstruation, and navigating social spaces with anxiety. One of the most pressing yet overlooked outcomes of this silence is the secretive and often improper disposal of used menstrual products. This not only heightens the psychological stress on young girls but also contributes to larger health and environmental concerns.

With growing awareness around menstrual hygiene management (MHM), there has been a significant increase in the use of sanitary pads as preferred menstrual absorbents. This shift has fuelled the rapid expansion of the sanitary napkin industry. While it is a separate and critical discussion in itself; how the menstrual product industry has positioned its products as the only route to achieving proper menstrual hygiene; what often remains unaddressed is the dark side of this growth: the mounting problem of non-biodegradable menstrual waste. A single disposable plastic sanitary napkin is estimated to take approximately 500 to 800 years to decompose, posing a serious long-term environmental threat.[4] According to Worldometer data as of July 18, 2025, India's population stands at approximately 1.464 billion, accounting for 17.78% of the world's total population.[5] India now ranks as the most populous country globally, surpassing China. Of this vast population, 48.44 percent are female, which translates to nearly 336 million women and girls who are of reproductive age and menstruating.[6] As per estimates by the Menstrual Hygiene Alliance of India (MHAI), approximately 36 percent of these menstruating individuals use disposable sanitary napkins, with each person using an average of eight pads per month. This amounts to 1 billion sanitary napkins used monthly, or roughly 12.3 billion annually. Given that the average weight of one sanitary napkin is around 11.3 grams, India is estimated to generate approximately 137,483 tonnes of menstrual waste every year, which equates to about 377 tonnes per day.[7] This staggering volume of non-biodegradable menstrual waste presents a serious challenge to India's environmental sustainability, waste management systems, and public health infrastructure.

Menstrual waste management cannot be examined in isolation; it is intrinsically linked to broader concerns of menstrual hygiene awareness and social acceptance. Recognizing this, the Government of India has launched several initiatives through various ministries and organizations aimed at improving menstrual health, product accessibility, and awareness; including menstrual hygiene scheme 2011, Rastriya Kishore Swasthya Karyakarma (RKSK), Swachh Bharat Swachh Vidyalaya (SBSV) and many more. However, the impact of these schemes is often moderated by deeply rooted socio-cultural taboos and silence surrounding menstruation. While policies promote hygienic practices and access to sanitary products, the prevailing cultural attitudes frequently prevent open dialogue, limit behavioural change, and restrict the effective implementation of these initiatives at the grassroots level.

The paper situates menstrual waste management within the SDGs, linking it to environmental sustainability and gender equity. Drawing on empirical data from rural adolescent girls in Fazilka district, Punjab, it highlights gaps between policy interventions and lived realities shaped by socio-cultural norms. It concludes by calling for gender-inclusive education, culturally sensitive policy reforms, and stronger implementation mechanisms.

Connecting menstrual waste management to environmental goals under the SDG framework

The significance of sanitation, effective waste management, and their wider environmental and climate implications is well established within the framework of the United Nations' SDGs. However, despite the SDGs' emphasis on gender equality and inclusive development, menstruation as a fundamental biological and social process remains inadequately addressed, even though it affects the daily lives, health, and dignity of nearly two billion people worldwide.[8] The connection between menstrual waste management and these global development goals is largely indirect but can be traced across several specific SDGs. The detailed link and analysis of these goals is mentioned below:

Goal 6 (ensure availability and sustainable management of water and sanitation for all)

The 6.2. By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.[9]

Link and analysis

While SDG 6.2 recognizes the sanitation and hygiene needs of women and girls, its relevance extends beyond MHM to include menstrual waste disposal. The goal's emphasis on safe, inclusive, and gender-sensitive sanitation implies the need for environmentally sustainable disposal infrastructure within sanitation spaces. However, menstruation and its specific waste management requirements remain insufficiently articulated within the framework. Inadequate disposal facilities often force unsafe practices, contributing to environmental degradation and weakening the broader objectives of sustainable and equitable sanitation.

Goal 12 (ensure sustainable consumption and production patterns)

SDG 12 emphasizes environmentally sound waste management across its life cycle (12.4), including the reduction of hazardous waste generation per capita and

improved treatment practices (12.4.2). It further calls for substantial waste reduction through prevention, recycling, and reuse (12.5), the promotion of sustainable public procurement in line with national policies (12.7), and ensuring widespread awareness and information for sustainable lifestyles (12.8). Collectively, these targets stress responsible production and consumption patterns, effective waste governance, and informed public participation to minimize environmental and health risks.[9]

Link and analysis

Menstrual waste disposal intersects closely with SDG 12 (Responsible consumption and production), especially with the rise of disposable sanitary products. While improved access has strengthened menstrual hygiene, it has also increased non-biodegradable waste, challenging goals of waste reduction and sustainable consumption. Inadequate regulation, infrastructure, and awareness further widen this gap, shifting environmental burdens onto women and communities. Thus, menstrual waste disposal remains a critical yet overlooked link between gendered consumption and environmental sustainability.

Goal 13 (take urgent action to combat climate change and its impacts)

Link and analysis

SDG 13 offers a framework to assess the climate implications of menstrual waste disposal. The growing use of plastic-based disposable products, often burned openly or incinerated without regulation, contributes to air pollution and climate-related health risks. Despite SDG 13's emphasis on reducing environmental harm through climate-sensitive policies, menstrual waste remains largely overlooked. Integrating sustainable, low-emission disposal methods into climate action plans is therefore essential.[9]

METHODS

The study was carried out between January and May 2025, adhering strictly to ethical protocols, including informed and parental consent and confidentiality of respondents. This exploratory and diagnostic study was conducted in rural villages of Fazilka district, Punjab, selected for its socio-cultural conservatism and limited menstrual health infrastructure. Data were collected from 300 adolescent girls through interview schedules, with specific focus on menstrual absorbents and disposal practices. Snowball sampling was used due to the sensitivity of the subject.

RESULTS

Source: primary data collected firsthand by the author

The increasing awareness around menstrual health and hygiene (MHH) and menstrual management promoted by various government ministries is evident through numerous initiatives and studies, most of which have focused on the provision of sanitary products, including government subsidies and free distribution in government schools. Supporting this national trend, primary data collected by the author (Table 1) reveals that an overwhelming 95.3% of adolescent girls reported using sanitary napkins during their menstrual bleeding, whereas, only 4.7% use cloth and after several time use dispose it. The findings clearly demonstrate a dominant preference for sanitary pads among the respondents, with minimal reliance on alternative absorbent materials. While the high usage of sanitary napkins may reflect improved access to commercially available menstrual products, it does not necessarily translate into the practice of adequate menstrual hygiene or the adoption of safe and sustainable disposal methods.

Table 1: Absorbent used during menstruation.

Absorbent	N	Percentage (%)
Sanitary pad	286	95.3
Cloth	14	4.7
Tampon	0	0
Menstrual cup	0	0
Total	300	100

Source: Primary data collected firsthand by the author.

As shown in Table 2, only 23.3 percent of adolescent girls reported reusing their menstrual absorbents, such as cloth or other reusable materials. In contrast, a substantial 76.7 percent of respondents indicated that they do not reuse their menstrual absorbents; rather, they dispose of them after a single use.

Table 2: Reusage of menstrual absorbent.

Responses	N	Percentage (%)
Yes	70	23.3
No	230	76.7
Total	300	100

Source: Primary data collected firsthand by the author.

The Table 3 illustrates the frequency distribution of disposal methods for used sanitary absorbents among 300 respondents. The most common method, chosen by 104 respondents (34.7 percent), has been discarding absorbents in areas designated for solid waste disposal, often referred to in villages as Roohdi. These communal waste areas contain household garbage, food scraps, and other waste, and are accessible to animals and birds. Burning is the second most prevalent method, practiced by 54 respondents (18.0 percent), while 51 respondents (17.0 percent) opt to bury their absorbents. A concerning 44 respondents (14.7 percent) dispose of absorbents in village ponds, locally called Chappad or Semnala, which are open and accessible to animals like dogs and other stray animals. Another 38 respondents (12.7 percent) dispose of used absorbents by flushing them down the toilet. A small portion, 6 respondents (2.0 percent),

reported washing and reusing absorbents, and 3 respondents (1.0 percent) mentioned other unspecified methods of disposal. Some respondents reported disposing of used sanitary pads in open drainage pipes outside their houses, which often leads to blockages in the pipes.

Table 3: Method of disposal for used sanitary absorbent.

Methods	N	Percentage (%)
Wash it and reuse it	6	2.0
Throw it in the pond	44	14.7
Burn it	54	18.0
Put it in the toilet and flush it	38	12.7
Throw it in the area specified for solid waste	104	34.7
Bury it	51	17.0
Other	3	1.0
Total	300	100

Source: Primary Data collected firsthand by the author.

According to the data in Table 4, 188 of the respondents with 62.7 percent indicated that their school has a functional incinerator for disposing of menstrual waste. However, the remaining responses reveal various issues: 7.3 percent reported that their school has an incinerator, but it is not working; 12.7 percent mentioned that while an incinerator exists, it has never been used; and 3.0 percent stated that the incinerator is present but locked, making it inaccessible. Additionally, 43 of the girls with 14.3 percent reported that their school does not have an incinerator at all. This data suggests that while a majority of schools have taken steps to provide incinerator facilities, there are significant challenges related to their functionality, accessibility, and usage, which need to be addressed to ensure proper menstrual waste management in schools.

Table 4: Incinerator facility in schools.

Response	N	Percentage (%)
Yes	188	62.7
Yes, but not working	22	7.3
Yes, but never used	38	12.7
Yes, but locked	9	3.0
No	43	14.3
Total	300	100

Source: Primary data collected firsthand by the author.

Table 5 details the preferences of adolescent girls for changing their sanitary absorbent while attending school. The data reveals that 185 of the girls with 61.7 percent prefer to change their sanitary absorbent in the school toilet, indicating that a majority are comfortable managing their menstrual hygiene within the school premises. However, 115 girls, which is 38.3 percent prefer to wait until they return home to change their sanitary absorbent, which could suggest discomfort with the facilities available at school, inadequate conditions of toilets or a fear of black magic, some girls highlighted that the proximity of the girls' toilets to the boys' toilets makes them uncomfortable, leading them to avoid using the facilities.

Table 5: Preference of place for changing sanitary absorbent while attending school,

Response	N	Percentage (%)
In the school toilet	185	61.7
Change after coming back home only	115	38.3
Total	300	100

DISCUSSION

Choice of absorbent and their disposal during menstruation

Menstruation, in addition to being a biological process, is also a socio-cultural phenomenon, as the practices, customs, taboos, management strategies, and associated values surrounding it vary significantly across different cultural contexts.[10] The selection of menstrual absorbents by most women and girls is primarily shaped by personal preferences, cultural norms, economic limitations, and the availability of products in local markets.[11] However, factors such as hygiene and environmentally responsible disposal methods are frequently overlooked or entirely missing from this decision-making process.

Existing literature underscores the interplay of complex cultural, economic, and societal pressures that influence disposal behaviours, often favouring practices that ensure privacy and discretion. Menstrual blood is widely perceived as impure or even harmful, fuelling beliefs that it must be hidden to prevent perceived risks; such as the threat of misuse in black magic, divine punishment, or curses affecting fertility.[12-16] As a result, girls who use cloth as an absorbent are often instructed to wash and bury it in secrecy, in alignment with deeply ingrained cultural expectations of concealment.[11] Similar practices are also observed among users of disposable sanitary pads. Mothers commonly report advising their daughters to dispose of used sanitary pads in a manner that prevents others from discovering them. The preferred methods; such as burning or burying; are often seen as the most culturally appropriate and practical ways to ensure the waste remains hidden and inaccessible to animals.[17]

Disposal of menstrual absorbents in open waste sites (Roohdi) or water bodies (Chappad, Semnala) exposes communities, especially children, to infections by creating breeding grounds for insects, rodents, and bacteria. Many adolescent girls lack safe disposal facilities, leading to unsafe practices such as burning, flushing, or open dumping.[11,13] Such waste can contaminate groundwater and communal water sources. Synthetic absorbents take decades to decompose, and

burning them releases toxins like dioxins, harming respiratory health and ecosystems. Scavenging animals, including cows, buffaloes, and stray dogs, risk ingestion-related illness or death. Menstrual stigma further compels secretive disposal practices like washing and burying, reinforcing negative attitudes and gender inequality. Inadequate rural waste infrastructure intensifies these risks, underscoring the need for improved facilities, sustainable menstrual hygiene education, biodegradable alternatives, and stronger policy and community-level interventions.

Unaddressed issues in menstrual waste management approaches

In response to the growing concern around menstrual waste management, India has introduced several policy frameworks and guidelines, issued by various government bodies. These include the SWM Rules, 2016 (Ministry of Environment, Forest and Climate Change), the Guidelines for Management of Sanitary Waste issued by the Central Pollution Control Board (CPCB), and the National Guidelines on MHM published by the Ministry of Drinking Water and Sanitation in 2015.[18] Additionally, components of the Swachh Bharat Mission also emphasize the need for sanitary waste management. While these policies aim to address the issue, they often operate in silos, remain fragmented, and suffer from weak implementation, particularly in rural and low-resource contexts. As a result, they remain disconnected from the lived realities and cultural sensitivities of adolescent girls and women. Currently, the two primary solutions promoted by these frameworks include:

Incinerators have been promoted as a solution for menstrual waste disposal; however, most sanitary pads contain plastic layers and super absorbent polymers (SAPs) that do not easily decompose and can release toxic gases if burned without proper emission controls, contributing to air pollution. In India, incinerators were initially introduced for general solid waste and later extended to menstrual waste under the MHM National Guidelines, which recommended their installation in schools.[18,19] The Central Pollution Control Board (2018) subsequently issued guidelines advocating high-temperature incinerators with emission standards. Despite this, concerns remain about compliance, enforcement, and the actual environmental safety of these systems.[20] Moreover, challenges related to the maintenance, regular monitoring, and management of odour emissions from school-based incinerators continue to go unresolved, raising concerns about the sustainability and effectiveness of incinerator-based solutions for menstrual waste management.[21] The findings presented in Table 4 further reinforce the gap between installation and actual usability of incinerators in schools. While 22 girls reported that an incinerator had been installed, they noted it was non-functional. Another 38 girls mentioned they had never used it due to the absence of training on its usage. Additionally, 9 girls stated that the washroom or toilet where the incinerator was located remained locked, limiting their access to the facility. Notably, 14.3% of the respondents reported that no incinerator had been installed in their school at all. These insights align with existing literature, which suggests that mere installation of incinerators is insufficient. Ensuring accessibility, providing proper orientation or training, and, most importantly, maintaining these devices regularly are critical for effective menstrual waste management. Menstrual waste disposal is made more difficult by the filthy, foul-smelling smoke that some school administrators reported emitting when used sanitary pads are burned in incinerator machines. This not only causes discomfort but also raises additional health and environmental issues.

A critical yet often overlooked issue that emerged during school and village visits was the lack of privacy due to the close proximity of boys' and girls' toilets. This spatial arrangement significantly compromises the comfort of adolescent girls, particularly during menstruation, and deters them from using these facilities; especially those equipped with incinerators. Many girls expressed feelings of self-consciousness and reluctance to access the toilets to change their sanitary pads, fearing that boys might become aware of their menstrual status. This apprehension stems from the fear of being teased or ridiculed, leading to emotional distress and embarrassment in a school environment. The inadequate provision of private, secure spaces not only hinders their ability to manage menstruation with dignity but also reinforces the social stigma associated with it. Consequently, such infrastructural shortcomings adversely impact menstrual hygiene practices and contribute to the broader marginalization of menstruating girls within the educational setting.

Currently, incinerators for menstrual waste disposal are installed primarily in schools, colleges, and select government institutions. However, during data collection in villages, girls reported using a variety of menstrual absorbents, many of which pose direct threats to the environment and the well-being of other species. The complete absence of incinerator facilities in rural areas presents significant challenges, as it limits safe disposal options and exacerbates the environmental impact of menstrual waste. This urban-rural disparity in infrastructure highlights a critical gap in menstrual health management (MHM), particularly for adolescent girls in village settings.

Sustainable menstrual products; including menstrual cups, tampons, and biodegradable or reusable sanitary pads; are widely acknowledged as environmentally friendly and cost-effective over time. However, their adoption in the Indian context remains limited due to several interconnected factors. A primary barrier is the lack of awareness and access to information about these alternatives, especially in rural and socio-culturally conservative areas. Several studies reported that in India,

girls and women still use old cloths and rags during their menstrual bleeding.[22,23] Additionally, the rapidly expanding commercial market for single-use sanitary products plays a critical role. The feminine hygiene industry in India is projected to grow at a rate of 5% annually until 2031 driven by aggressive marketing that positions disposable pads as the most hygienic, reliable, and modern option.[24] Over time, this has contributed to a strong belief; especially among young girls and women; that only branded sanitary napkins can ensure complete absorption, stain protection, and comfort during menstruation, making them appear superior to traditional materials like cloth or emerging sustainable alternatives.[25]

Despite being a cost-effective and eco-friendly option, menstrual cups face significant resistance in India due to prevailing cultural taboos, lack of awareness, and discomfort with internal products. Many women associate menstrual cups with invasiveness and virginity concerns, especially in rural and traditional settings.[26] Limited health education and minimal promotion of such alternatives further contribute to their low acceptability and widespread hesitation among adolescent girls and women.[27] While menstrual cups are cost-effective in the long run, their initial purchase cost, ranging from ₹300 to ₹1000, can be prohibitive for many women and girls, especially those from low-income households[6]. In contrast, single-use sanitary napkins are perceived as more accessible due to their lower upfront cost, despite being more expensive over time. The lack of subsidized access to menstrual cups, combined with limited government promotion and low awareness, restricts their adoption in rural and economically disadvantaged communities.

CONCLUSION

Several schemes under MHM have been introduced with the intention of ensuring that adolescent girls do not miss school during their menstrual cycles. While these interventions have undeniably improved access to sanitary products, they often fall short in addressing the deeper infrastructural and psychosocial barriers that girls continue to face in everyday life. A growing number of girls now report delaying the change of their sanitary products until they return home, highlighting that school sanitation facilities remain either inadequate or are perceived as unhygienic, unsafe, or culturally uncomfortable. This practice not only poses serious health risks but also reflects the social discomfort and stigma that still surrounds menstruation. In many communities, menstruation continues to be associated with impurity and shame. Drawing from Mary Douglas's seminal work Purity and Danger, menstrual blood is characterized as a 'matter out of place', symbolizing impurity and danger. This perception deeply influences how girls and women are treated during their menstrual cycles; restricting their access to public spaces, mobility, and dignity.

In terms of global goals, with less than five and a half years remaining to achieve the SDGs, the current approach to menstrual health continues to focus predominantly on surface-level interventions; such as the free distribution of sanitary pads and awareness campaigns. While these efforts have contributed to increased product usage, the critical issue of menstrual waste management remains largely overlooked or inadequately addressed, posing significant challenges to both environmental sustainability and public health. Although the SDGs offer a renewed vision for achieving adequate and equitable sanitation systems, the socio-cultural context in which these goals must be implemented is often overlooked. This gap presents significant challenges for low- and middle-income countries, where sanitation practices are deeply influenced by cultural beliefs, social norms, and material realities; factors that are rarely integrated into global sanitation frameworks.

Thus, while progress has been made at both national and global level, the lack of integrated efforts, especially around safe disposal infrastructure, awareness of sustainable alternatives, and culturally sensitive education, remains a critical gap. Addressing menstrual waste management not only involves technical and environmental considerations but also calls for a shift in societal attitudes. To bring about long-term change, MHH must be approached holistically, through inclusive education, improved infrastructure, policy coherence, and a sustained challenge to stigma and taboo.

Recommendations

Normalising menstruation requires a systemic cultural shift that begins with breaking the silence through open conversations in families, schools, and communities. Education must extend beyond girls to include boys, parents, and the wider community, reinforcing menstrual health as a shared social responsibility. It should move beyond hygiene awareness to cover menstrual products, safe usage, and environmentally sound disposal practices. Simultaneously, accessible and sustainable disposal infrastructure and affordable menstrual products are essential to ensure dignity and privacy. When awareness, education, infrastructure, and access align, menstruation can be reframed as a normal and healthy part of life.

The mere installation of incinerators is insufficient for effective menstrual waste management. The study, supported by existing literature, reveals that beyond infrastructure, proper training, accessibility, and community sensitization are essential. Field findings showed that in many government schools, installed incinerators were poorly maintained, often broken, rusted, unused, or lacking awareness among students and staff regarding their operation. Raising these concerns sometimes led to defensive responses from authorities, reflecting limited accountability and discomfort around menstrual health discussions. Addressing these gaps

requires training students and staff, ensuring continuous toilet accessibility, and expanding disposal facilities to public spaces such as community halls, bus stops, and primary health centres. Regular monitoring, maintenance, and culturally sensitive community engagement must be central to menstrual waste strategies; otherwise, such initiatives risk remaining symbolic rather than truly transformative.

The promotion of sustainable menstrual products, such as menstrual cups, reusable cloth pads, and biodegradable alternatives, requires strong policy support and targeted interventions. Beyond awareness campaigns, the government must ensure affordability and accessibility, especially in rural and low-income areas where high initial costs and limited availability act as barriers. Cultural taboos, misconceptions about bodily insertion, and lack of exposure further hinder acceptance. Therefore, comprehensive, gender-inclusive education and community outreach programs are essential to challenge stigma and normalize eco-friendly menstrual products, alongside collaboration with community health workers, educators, and local influencers to foster grassroots behavioural change.

Data in Table 3 reveals the absence of safe and hygienic disposal practices among respondents, highlighting the urgent need for targeted community-level government intervention. Local authorities must install appropriate menstrual waste facilities, including low-emission incinerators at designated common points and clearly marked, separate bins for menstrual waste. These should be placed in accessible, private, and stigma-free spaces to ensure confident use. Additionally, dedicated budget allocations within village panchayats are essential to support regular maintenance, sustainability, and effective implementation. Such structural measures are crucial for ensuring safe, dignified, and environmentally responsible MHM in rural areas.

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