

Environmental Pollution-Perceptions and Views on usage and Disposal of Diapers: A Case Study of Gwanda Urban

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Abstract:- Background:- Environmental challenges have presented themselves in various forms and they needed a proactive and bottom-up approach in addressing them. Municipalities have a mandate of collecting and disposing solid waste, but they may not be able to do it effectively on their own. Partnership in waste management is the way forward in the 21st Century.

Methods:- Ethnographic method of collecting data was used and this method was relevant in that the researcher would be among the respondents for a long time interacting, living with them while collecting the data. Views and perceptions of residents in Gwanda were captured through unstructured interviews and remote sensing devices.

Results and Discussion:- The wide usage of diapers is because of the development that caught up with societies in both developed and developing countries. Modern mothers prefer using disposable diapers compared to the traditional none disposable nappies that were used in the past decade. The un-comfortability in washing nappies may have influenced the adoption of using disposable diapers. Data was generated, analyzed and discussed. Diapers are convenient when traveling and working mothers who have no time to wash nappies and more favorable during the rainy season. It was established that breaking away from using traditional nappies was easy. Some respondents were not aware of the environmental impact of disposable diapers while some were able to come up with their perceptions on how the disposable diapers impact the environment. It was found that they are a mess to the environment and use of bins proved not to work as dogs spread them around. The disposable diapers have polluted the environment in Gwanda suburbs.

Conclusion:- The traditional system of using nappies has been replaced by usage of disposable diapers. The impact of diapers on the environment has been extensively examined. The municipalities seem not to have a provision for such waste. It was not clear if the used diapers can be classified as clinical waste or as just municipal solid waste.

Recommendation:- Municipalities need to engage the stake holders on management of this type of solid waste. An integrated approach in managing diapers in the town could yield better results that may reduce cases where diapers are exposed anywhere in the town including its disposal in bushes.

Keywords:- Environmental Pollution, Health, Usage of diapers, Disposal of Diapers, Urban.

I. INTRODUCTION

A disposable diaper was first made in 1946, [1]. The special feature the diaper has is the outer layer which is waterproof, and the inner layer made of cloth. When development took place in Western countries, it spreads so quickly such that use of disposable diapers started in developed countries and eventually found its way to the less developed nations. The researcher remembers that when people started using diapers in Zimbabwe, they were considered as luxury items, used only when people embarked on long trips and at times used when there was special function because there can be removed fast without taking time of other activities or when embarking long trips and when there are special occasions. The usage of disposable diapers was also associated with the economic status of the user. Those from low economic status did not use them more frequently. One can point out that, the usage of disposable diapers is not part of the African culture; hence its genesis was in western countries such as Canada, [2]. The disposable diaper used today was first produced in 1982 and from there it was on record that the USA used about 18.6 billion diapers in 2006, [3]. Similar trend was observed by [4] where in their analysis they generated data which showed that the demand for disposable diapers was high in three Asian countries. With the rise of world population, the usage of diapers increased too, the littering also increased, however the environmental effect and the likely health risks associated with the disposal of the diapers was outweighed by the capital generated by the manufactures.

It should be noted that countries like USA has on many occasions, pulled out from summits were countries deliberated on issues that had to do with control of environmental pollution, for example, in 2000 they pulled out from the Johannesburg Earth Summit and in 2017 she pulled out from the Paris Climate Agreement. Protecting the environment becomes second when thinking of economic gains. Countries may negate protecting the environment as long as they gain monetary.

What seems to lack is the connection between all stakeholders because the invention of disposable diapers was good, and it showed that mankind has an initiative of solving their problems and, but the gap is the sustainability of the invention regarding the environment. It was noted that disposable diapers were continually improved and refined to their present look. There is no doubt that most females in Gwanda appreciate and use of disposable diapers. With the

AIDS pandemic and environmental epidemiology, diapers are now not only an issue of babies, but the health as well as an environmental issue. Terminally ill, in and out patients may find themselves using them. With the in patients become a different issue as those are disposed of properly. The challenge is of the outpatients, how their soiled diaper is taken care of from the point it is generated to the disposal site. What motivated Marion [1], in designing and manufacturing the diapers was her experience of the challenge of using non-disposable waste where she was frustrated by changing and washing the nappies repeatedly, [5; 4]. This could also be the same reason that motivated many mothers of today to using the disposable diaper.

The importance of the study is to educate the community, the waste management service provider, policy makers as well as those who implement waste management policies because the mandate of managing solid waste of this kind cannot be the municipalities alone. The idea is to bring into picture the involvement of all stakeholders and that could make the managing this type of solid waste much easier for the municipalities. The users of diapers should be aware of their implication on the environment and they should be able to manage the waste they generate in the process of using the diapers. The study creates an awareness that empowers community members and other stakeholders on the handling and disposing the soiled diapers.

II. STATEMENT OF THE PROBLEM

A large percent of municipal solid waste consists of disposable diapers and the fact that there are made of different materials on which some cannot decompose it becomes a challenge in the landfill. It was observed that diapers are dumped behind bushes around the residential areas in Gwanda town. The only materials in diapers that will break down are wood pulp and SAP. The non-woven fabrics will not break down.

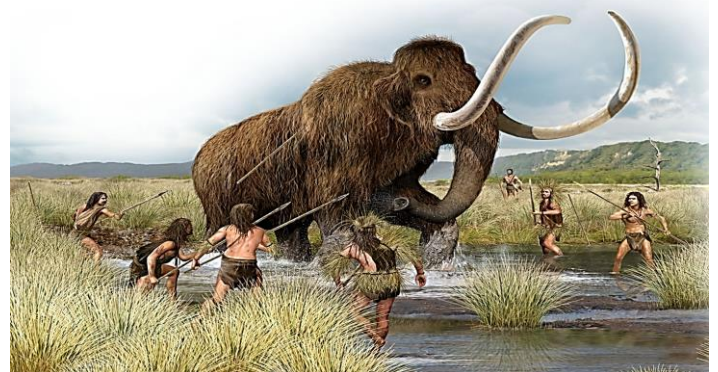
From the excrement produced, many diseases are passed through to animals and water bodies, such as the polio virus, [4; 6]. Lack of participation by residents in the management of this type of solid waste is happening in Gwanda and does not prepare residents to sustainably dispose the soiled diapers. Residents are used to being told what to do and not contributing to the transformation and reforms that may be good for the 21st Century Environmental health. While this problem affects most urban areas, this study seeks to explore ways of engaging the public through dialogue and empowering them. The usage of disposable diapers has risen and continues to rise in Gwanda. Diapers take about five hundred years to decompose which is a period the lifespan of a human being. In a way, the more people use diapers; they create challenges for the future generations, [2]. The other impact of the diapers is that they produce greenhouse gases and release methane gas into the environment, [

It has been observed that most if not all families use disposable diapers on babies and terminal ill people and the concern is the disposal of the diapers because they cannot be flushed in a water system toilet common in urban areas. The soiled diapers have become a cause of concern as they are disposed in near-by bushes. Dogs help in spreading them

everywhere and because some contain human excreta, they can contribute to the spread of infectious disease. Not only that, they taint the sight creating an ugly face of the environment, they facilitate in the lifecycle of pathogenic-organisms, therefore, the study enabled the sharing of experiences and knowledge on suitable ways of handling and disposing used diapers. It also explored the experiences of the local people in Gwanda town and paved way to good management of this solid waste. The study educates, informs and influences a change in human behavior towards safe disposal of used diapers. The paper is arranged as follows: First, the researcher discussed the questions that guided the study, second was the components that make up diapers, the processes involved in making disposable diapers. Third is the methodology used and data collection, followed by the discussion of the findings and lastly the conclusion and recommendations.

III. PHILOSOPHICAL FRAMEWORK

The study is informed by participatory model in the management of solid waste. Participatory activities enabled the residents to decide their destiny by sustainably dispose the used diapers. The scenario of Stone Age hunters can be applied in the management of solid waste, where by in hunting a big animal there was a need for creativity, critical thinking, collaboration and communication. Collaboration and working together can be useful in that all stakeholders put their heads together in resolving environmental challenges. The diagram below shows Stone Age hunters working as a team to achieve greater goals which can also be done by human communities in handling environmental pollution.



The scenario of Stone Age hunters
Source: [8] (Retrieved 06-07-2017)

The result is achievement through sharing ideas and techniques in management of solid waste in Gwanda urban

IV. OBJECTIVES OF THE STUDY ARE TO

- Determine the impact of diapers on the environment.
- Equip respondents with the knowledge, skills and values essential for success in managing and disposing diapers
- Inculcating the positive perceptions on disposing diapers without damaging the environment
- Explore the differences/ similarities between diapers used in homes and clinical waste generated in hospitals and clinics?

V. THE STUDY IS GUIDED BY THE QUESTIONS BELOW

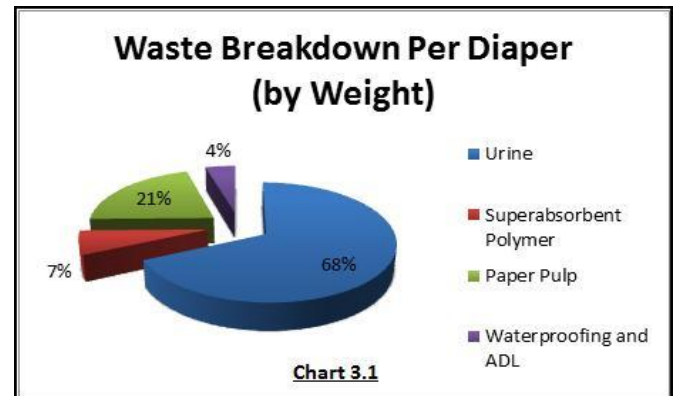
- What do you perceive as the impact of Diapers on the environment?
- How best can diapers be disposed of?
- What are the residence's perceptions on environmental pollution?
- How are diapers waste generated different from the clinical waste?

VI. LITERATURE REVIEW

The literature review puts into picture what other scholars have researched on, on the environmental impact of disposable diapers. [4] (pp.1), say, "...improper disposal of nitrogenous waste is a major factor in the spread of infectious diseases." Indiscriminate disposal of soiled diapers is common in most towns in developing countries. The study conducted by [4] was in Dhaka, a town in a developing country. My study is also centered on a town in a developing country. In Gwanda the dumping of used diapers has become a huge issue as it alters the environment to none habitable condition. The situation in Dhaka was different from that of Gwanda, because in Gwanda soiled diapers are a component of solid waste that is not talked off by the Municipality Waste collectors. It is as if it does not exist, hence the bushes in the town is littered with used diapers. This kind of waste is not catered for by most municipalities in developing countries. "Moreover, the cultivation of *P. Ostreatus* (biological decomposing agent) of used disposable diapers for the treatment of third type of urban waste leads to a reduction of more than 80% of the mass and volume of waste, [9]. "An online survey was conducted with regards to the lack of awareness concerning the issue of diaper disposal," [4] (pp.2). The methodology used [4] was an online survey as the secondary data from Bangladesh Bureau of Statistics was used and GIS applications were used on the site. My study relied on primary data that was informed by ethnography underpinnings. This was through an environmental impact assessment where interviews were conducted, and observation used complimented by remote sensing tools.

The materials used in making diapers are plant material and some are obtained from the processing of crude oil and these, 'the material used are the components, are the waterproof wood material, synthetic polyacrylate and plastic,' [7].

When the baby is at a young stage that is when diapers are most needed. At that stage babies use about 6,500 diapers on average and they take 1,625 quarts of oil at the manufacturing stage, [5]. It can be assumed that all chemicals have side effects such that they can be overcome by the benefits of using diapers. A research paper said, "This sodium polyacrylate is an amazing water absorber -- it can absorb 200 to 300 times its weight in tap water (even more if the water is distilled) and hold it in a gooey gel, [10]." Its ability to absorb and store the fluid over a long time made it ideal and suitable for use in diapers we see in the market to this day.



Source: [2; 4]

The Fig.1 shows the mass distribution of different parts of a soiled diaper and the most abundant substance being urine, [11] and this was also pointed by [12] that the largest part of the material that constitute the disposable diaper is the absorbent named Acquisition Distribution Layer (ADL) and its role being that it distributes urine evenly within the diaper. "With reusable diapers all urine gets processed as sewage, it does not get incinerated or land filled. Individual reusable diapers typically get used lots of time; after their original users out grow them, they get handed down not just to young siblings but even get traded amongst communities of usable diaper users." [2] (pp.4). It was also pointed that, "The greater the number of users per individual diaper, the smaller amount of solid waste produced overall," [2] (pp.4). The situation can be hypothesized in that when population increases the usage, dippers increase.

There are several problems that are at different stages of the diaper's life cycle because the diaper also pollutes the air and water bodies. It is unfortunate that the impact of diapers on the environment may not easily be realized because the users need a strong message to convince user that improper disposal of the used diaper impact negatively the different sectors of the environment. Hence in this study the assumption is that by involving the Gwanda urban community a positive change on their perceptions may be realized. This is in line with the Santiago Theory that say, people do not resist change if they are involved in the process of initiating the change, so the bottom-up approach in tackling this type of environmental challenges may yield positive results and [2] (pp.7), says, "the only sure method to get people to change their habits is through education. The same sort of approach currently taken with recycling programmes should be applied to diapers.... People need to be fully informed to make responsible decisions," [2] (pp.7).

VII. MATERIALS & METHODS

Ethnographic method of collecting data is used and this method was relevant in that the researcher would be among the respondents for a long time interacting and living with them while collecting the data. Ethnography basically depends on observation, focus group discussions and unstructured interview methods. The researcher spent most of his time with respondents, taking part in all their daily activities while

collecting data. Ethnography is an old method of generating data and was first used by sailors during the great voyages in the sea, for example, [13] and it was also used by Marcopolo, Beatrice Potter-Webb, 1858-1943. It can be said that ethnographic method contributed in the generation of data during that time and can still be used here and now. The other scholar who used the same method was [14] and was said to be the first to have used ethnography method. The other researchers who have written about ethnography are [15] and [16]. While the founding scholars of ethnography are old, the method has stood the taste of time and the researcher found it relevant if an in-depth study of an issue is to be done with accuracy to use ethnography.

VIII. DATA COLLECTION

Observation was the major method used in generating data and was complimented by interviews and remote sensing technology. Interviews were scheduled and a follow up to those who missed interviews was done. The findings from interviews were triangulated with the findings from the observation aided by remote sensing technology. Triangulations enabled the researcher to counter on the weakness of each of the methods used there by increasing the credibility of the findings. While conducting interviews, the researcher purposively selected the respondents. Purposive sampling enabled the researcher to collect data from a specified cohort of respondents.

IX. RESULTS AND DISCUSSIONS

The findings from the observation method show that there was an increase in the littering of soiled diapers in Gwanda town. The increase of littering in the nearby bushes with soiled diapers is correlated to the rise of population in the town because of in migration to the town from other towns and rural areas. The levels of environmental pollution have risen and, a Respondent reiterated that, ‘...the Municipality of Gwanda’s infrastructure for handling solid waste has no capacity to handle soiled diapers. The toilet system is the modern flush one and diapers cannot be flushed down as they can block the sections of the sewer system.’ The dilemma is that such waste might find its way into the refuse bins which are not designed for such waste, and if the soiled diapers are thrown into the refuse bins, there will be a smell that attracts flies which are part of the equation when it comes to communicable diseases. At times dogs would tip-off the bin and scatter such waste which also becomes a health hazard to the community.

A resident from Hlalanikahle residential area said, ‘the option we remain with is to sort the waste we generate so that used diapers are segregated from other refuse, under the cover of darkness we dump it where ever it is possible because the municipality is not doing anything about it.’

The other resident said, ‘...areas such as Hlalanikahle residential are not serviced with sewer facilities and a public toilet was installed and individuals cannot construct septic tanks and under such conditions use of near-by bushes become the only solution.’

A resident at Spitzkop North Extension pointed that, ‘most residential houses in the suburb do not have running water and use the bush as the toilet and that is where we take used diapers to as there is nothing we can do. You see the environmental, we are experiencing are huge challenges because it is not only pollution around the town area, environmental degradation is rampant as we depend on wood fuel because there are a lot of bureaucracies with service provision. No water, no electricity for the residents in the two suburbs, the authorities assumes people do not need such services and these have led to what our environment is like.’

The other resident said, ‘we are vulnerable to all sorts of environmental disease outbreaks and it is unfortunate to belong to the low class.’ The study found that there were several complaints by the respondents where there seem to blame the municipal authorities and while acknowledging that their actions are influenced by the situation they find they find themselves in. One would say the common space is not well managed by both the residents and the authorities, as each of them have a responsibility to account for.

Responses to question 1: Pollute the environment in several ways which can trigger environmental linked disease outbreak such as cholera, diarrhea, shigelloses and even typhoid. A respondent said, ‘I believe diapers, need to be disposed the way we dispose used tissue paper as they have something in common.’ The unfortunate is things are not happening in that way because these can block the water system toilets.

The other respondent indicated that they had a huge potential of negatively affecting the environment and health of the community members. People who use them are not in good health, for example, those with advanced stage of AIDS, and other terminal diseases, the diapers they have used may have pathogens and may also be favorable to supporting the growth of pathogens.

Used diapers are a source of microorganisms that end up in food, water and air and one respondent pointed that, ‘the microorganisms from the disposed diapers are bacillus and clostridium which has bacteria that degrades the enzymes that spoil the food,’ the other respondent pointed that, ‘while diapers when exposed to the air and soil they are able to spread communicable diseases such as cholera in a community.’ This is because houseflies visit the used diapers, and which lead to biological hazards.

Not only do disposable diapers account for a lot of the trash shortens the lifespan of the municipality’s landfills, but they also pose serious risks to the environment and people alike. A nurse pointed that, ‘diapers release volatile organic chemicals. Toxic chemicals such as toluene, ethylbenzene, xylene and dipentene have been linked to adverse health effects in humans with long-term exposure. The inner absorbent layer of a disposable diaper is also treated with chemicals, which can trigger allergic reactions. Disposable diapers often contain dyes and dioxin, which is formed as a by-product of the chlorine bleaching process. Dioxin is a carcinogen, which means it can cause cancer. When released into the environment, the toxin can accumulate in humans and animals.’

The other responded said, 'The Municipality of Gwanda's land-fil is near Manzimnyama River, and during the rainy season, rain water flows from the land-fil to contaminate the water.' The location of the land just next to the river shows that proper environmental management was never conceptualized by the authorities. Still the expansion of Gwanda town sees residential areas being a few meters from the land fill, an example is the Hlalanikahle residential area.

Responses to question 2: One responded suggested that used diapers, 'should be disposed through incineration,' while some were against that as they suggest that it could pollute air if such a process is used. Some respondents were for the view that diapers cannot be a solution because two possible ways of disposing diapers has shown that none of the methods used are not safe to the environment and its inhabitants.

Responses to question 3: What are the residence's perceptions on environmental pollution?

Waste management officers pointed that diapers take many years to decompose even when exposed to oxygen and sunlight, which shows that once land is polluted and would need more time for them to decompose. A large amount of untreated diapers disposed in landfill each year such as plastic diapers may end up contaminating ground water. Another concern is that microorganisms on faeces could end up leaching into water bodies.

A researcher said, 'Decomposing diapers release methane into the air and high concentration of the methane may be explosive when there are flames in the landfill.' A medical doctor held that methane gas is dangerous when inhaled as it tends to replace oxygen in the body systems.

A respondent reported that diapers release volatile toxic chemicals such as toluene, ethylbenzene, xylene and dipentene and went on to say these are linked to adverse health effects in humans with long-term exposure. Exposure to these substances leads to more health risks to community members exposed to the gas.

A mother Said, 'the inner absorbent layer of a disposable diaper is treated with chemicals, which influences some allergic reactions to some people and even worse to babies as they are more than elderly people.'

A mother indicated that disposable diapers often contain dyes and dioxin, which is formed as a by-product of the chlorine bleaching process. Dioxin is a form of carcinogen, and trigger cancer in humans. There is an exposure to environmental dioxin buildup in humans and animals and animal bodies.

The soiled diaper contaminants the soil and other parts of the environment. They influence direct and indirect contamination of soil, water and air as they release some gases into the air. Diapers contain harmful substances such as bleach, acid or oil it is important that it is disposed of in approved containers and labeled correctly. Paper, plastics and other materials that are burned can contaminate the air. If they contain toxic chemicals like dioxin they can reach the air that

people breathe and cause a public health risk. Garbage that is disposed of improperly can also begin to release methane gases to the environment. According to one of the respondents, 'some of the gases released are greenhouse gases.' Used diapers are a component of untreated sewer in a way, as they contain faeces and urine and these are a threat to both animals and human health.

Responses to question 4: It was observed that different views from respondents were solicited regarding clinical waste and soiled diapers. A nurse pointed that the two were not the same in that in clinical terms, 'clinical waste refers to parts of the body tissue, the tools that are used such as injections, swabs, used cotton and bandages that have been used.' As such diapers contain the faeces and urine just like any faeces and urine disposed in the toilet. A medical doctor's views were like those of the nurse and even referred to some literature to give a convincing difference.

Another respondent pointed that: 'while there might be a difference between clinical waste and used diapers it must be acknowledged that the faeces of human beings may contain harmful pathogens that may increase the disease burden.' For example, if the patient using diapers has cholera, the cholera causing organisms can leak into sources of water from the diapers, some vectors such as flies may also help in translocating the pathogens back to homes which could trigger an endemic.

An environmentalist said, 'domestic animals such as poultry, dogs, cattle walk over them and at times they graze and get contaminated grass.' The bacterial organisms can lead to gastro-intestinal track but does not end there as the infection have impact on the whole food chain. Used diapers are rich in microorganisms and when chicken, birds and other animals are in contact with them pathogenic organisms are transferred from one point to another. The respondent went on to say feathers and skins of animals can also be infected in the process.

Use of remote sensing technology revealed the extent to which diapers have polluted the environment in Gwanda town. The plates were captured on different locations and what is hurting is amount of the diaper disposed in bushes.

Plate A is showing the black refuse bags loaded with diapers



Source: [17]

The researcher found the above dumped in a nearby bush in Gwanda urban. The item on the lower left hand is a used diaper and one of the black bag particularly the top middle bag had several used diapers. It was also noted that the used diapers had a bad smell that attracted flies.

Plate B is showing diapers that have been scattered all over by dogs from the point source



Source: [17]

The used diapers have been scattered by dogs and other animals that roam the bushes. The sight of the environment get altered in that the natural attractiveness of the environment is disfigured. In the process it was noted that air also get polluted.

Plate C is showing diapers that have been scattered all over by dogs from the point source



Source: [17]

Still on another site it was found plastic bags that solid waste which included used diapers. It looked like the items in the plastic bag where scattered by animals such as dogs. While diapers are favorable to most child bearing mothers, their impact need to be talked about because at times people act in

ignorance hence the need to educate the on the impact of used diapers on the environment

X. CONCLUSION

The study intended to make the community to be aware of environmental pollution taking place in their town. It was also observed that some community members were aware of the possible impact of used diapers on the environment. From the study it was observed that respondents showed that they may want to be involved in protecting the environment and that could possible happen if municipalities have some open-door policy that would enable them to make contributions on how effective to manage this type of solid waste. The Municipality of Gwanda should also think of better ways of handling used diapers and proper disposal that would not harm the environment. Involvement of all stake holders in managing solid waste (used diapers) can arrest epidemics and endemics in Gwanda. It would not help for action to be taken after a catastrophe has taken place. The survey conducted was in a very small scale with a limited number of participants, so the data obtained could be said to be more of a representation of public perceptions and accurate as captured through observation. Other researchers may conduct the survey on a larger scale for the findings to be more accurate and reliable.

XI. RECOMMENDATIONS

It is recommended that the users of diapers should first sanitize them before they dispose. After sanitizing them, they then pelletize the non-woven material of the diapers. The SAP is the materials which is recyclable for example the wood pulp, [4]. The final thing that should be done is to destroy the bacteria in the excreta and use the material as compost. In such endeavor, there will be reduction in polluting the environment and the steps taken also reduce the possibility of pandemics and epidemics in the area. These initiatives can be realized if the municipality works in collaboration with other stakeholders such as the Department of Public Health, the Ministry of Environment Department and the residents of Gwanda in creating public awareness of the environmental threat caused by littering of soiled disposable diapers.

It was suggested that the model of five CsD can be effective in reducing disposal of diapers at undesigned points in the town.

| Choice | <i>People are wired for free will</i> |
|-------------------|--|
| Collaboration | People are wired to be social creativeness |
| Collaboration | People are wired to be social creative |
| Communication | People are wired to be social creative through communication |
| Critical thinking | They have the ability to solve environmental challenges |
| Disposing | They can use sustainable ways of disposing used diapers |

Table 1. The Social Nature of human being

The five CsD are supposed to characterize what happens in a social setting such as in Gwanda town. The underlying fact is that human beings are social animals who are free to make a choice, they collaborate, communicate and are endowed with critical thinking skills and above that they generate the solid waste (disposable diapers) and are supposed to dispose them in a sustainable manner. Residents may not be told to stop using diapers but need to be part of the equation in solving environmental pollution because of soiled diapers. By being part of the solution, a lasting solution can be realized. The scenario of Stone Age hunters, hunting such a big animal called for creativity skills, critical thinking, collaboration and communication. This can be applied in our environment when residents are engaged in solid waste management initiatives.

These are temporal measures that can be used to secure a safe environment which can be resisted by most diaper users because the migration from traditional nappy to a disposable nappy was a way of running away from cleaning the soiled nappies.

- Remove the solid waste from used diaper and throw it into a toilet. By removing the faeces from the diaper before throwing it away would help in reducing pollution by human waste. The mixture of faeces and water can be thrown into the toilet or flushed down the drain.
- This also reduces the odor that makes dogs to scatter the used diaper all over and not only this, as this would also reduce the rate at which house flies have access to soiled diaper. Sanitize the diaper with chemicals that kill microorganisms such as chlorine.
- People need community and environmental education because at times the action of littering with diapers might be because of lack of understanding the impact. Education has been a powerful tool used to fight disease that emanate from the environment and the same can be used on the use and proper disposal of diapers.

XII. ACKNOWLEDGEMENT

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